PT.TIM.9

INSTALLATION AND OPERATION MANUAL

2760 DATA LOGGER W/INTERNAL STRIP PRINTE

2762 DATA LOGGER WITHOUT INTERNAL STRIP PRI

B & F MODEL SY 76 STRAIN LOGGER

FX SYSTEMS CORPORATION

KINGSTON, N.Y.

MODEL. SY-76

3-WIRE MUX MODEL 30294-11

INSTALLATION AND OPERATION MANUAL

2760 DATA LOGGER W/INTERNAL STRIP PRINTER
2762 DATA LOGGER WITHOUT INTERNAL STRIP PRINTER
B & F MODEL SY 76 STRAIN LOGGER

Gary Bishoff
914-338-0515
Kingston NY

Tom Brennan

250 + expenses

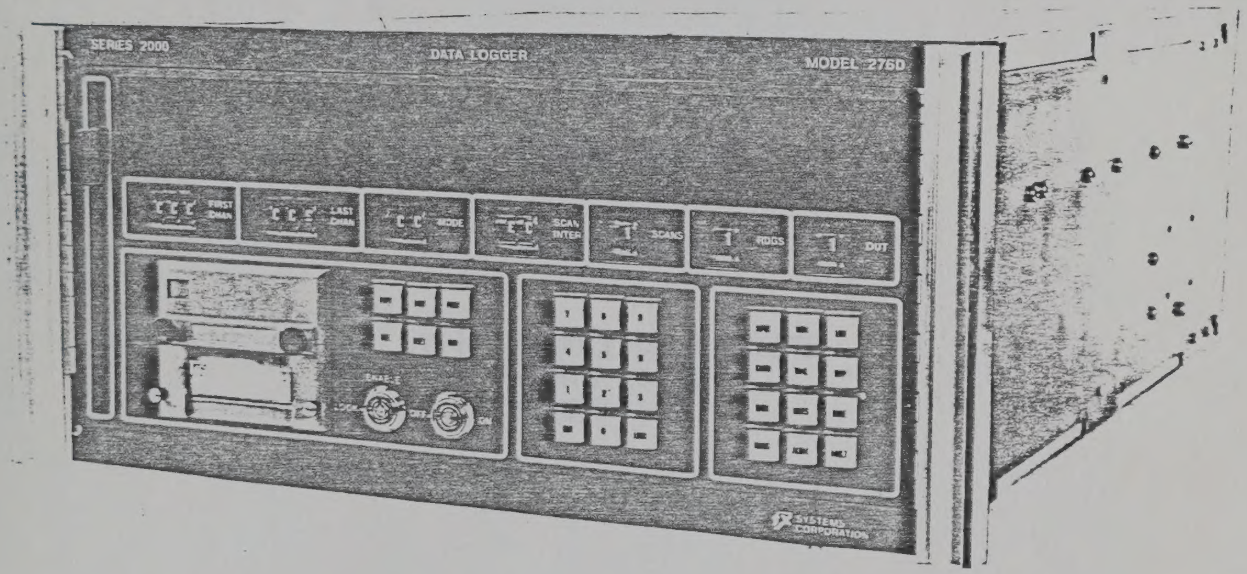
FX INSTRUMENTS
SYSTEMS CORPORATION

PRODUCT DATA

INSTALLATION AND OPERATION MANUAL

FOR

Model 2760 Data Logger Mainframe with Internal Strip Printer
Model 2762 Data Logger Mainframe without Printer
B & F Model SY 76 Strain Logger


SERIES 2000
DATA LOGGER
MODEL 2760
FIRST CHAN
LAST CHAN
MODE
SCAN INTER
SCANS
RDGS
OUT
FX SYSTEMS CORPORATION

FX SYSTEMS CORPORATION PO BOX 1818 KINGSTON N.Y. 12401 914-338-0515
B&F INSTRUMENTS DIVISION PO BOX 238 CORNWELLS HEIGHTS, PA. 19020 215-639-7100

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III SYSTEM OPERATION

IV INSTALLATION

V SYSTEM SET-UP

VI MAINTENANCE

VII MODULE DATA SHEETS
PARTS LISTS
SCHEMATICS

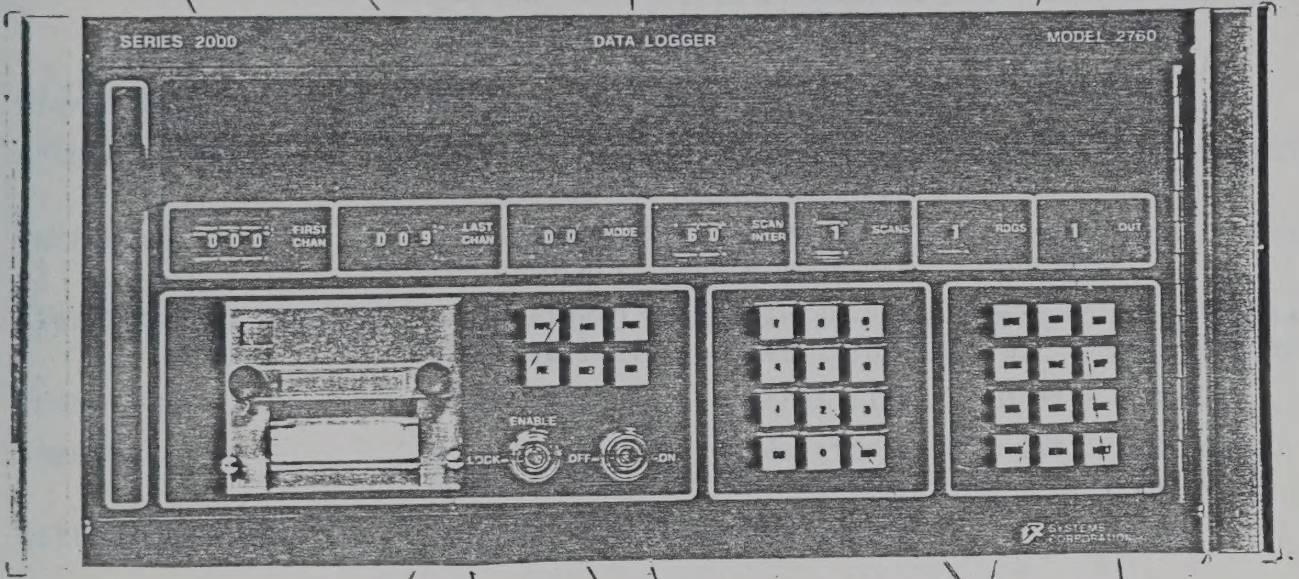
The materials contained herein are subject to change. Further details and specifications concerning the use and operation of FX Systems B&F Instruments equipment are available in the applicable data sheets for specific options.

Front View
Figure -1-

CHANNEL & DATA DISPLAYS
Channel Number and ±4½ digits of data.

CLOCK DISPLAYS
Date and Time of Day.
Month, day, year and hours, minutes, seconds.

SPECIAL DISPLAYS
Display also indicates real engineering units (v,mV,PSI,μE,lbs,Eu), over range and open indications.


SERIES 2000
DATA LOGGER
MODEL 2760
FIRST CHAN
LAST CHAN
MODE
SCAN INTER
SCANS
RDGS
OUT
ENABLE
LOCK
OFF
ON
SYSTEMS CORPORATION

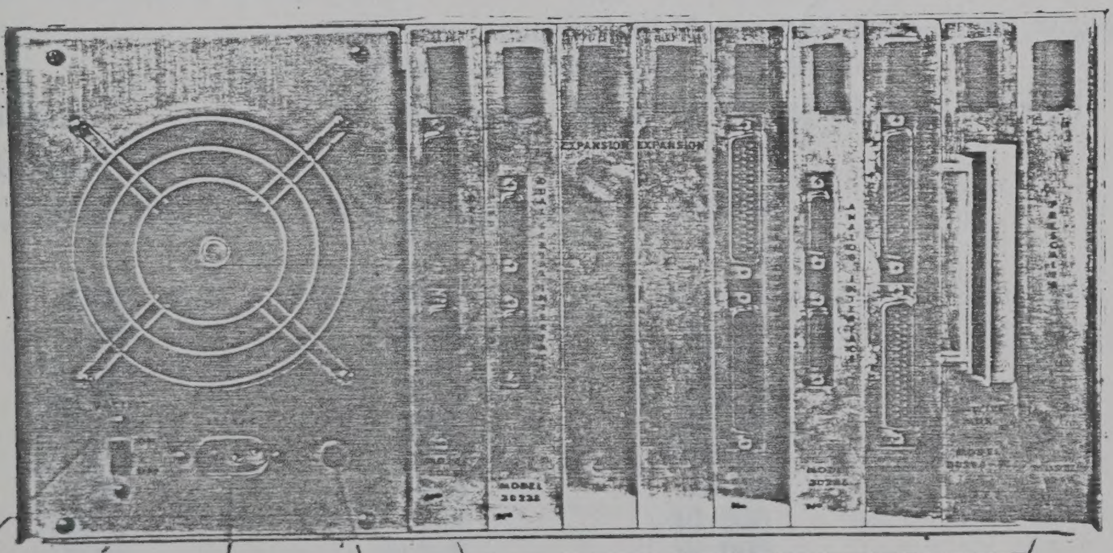
NORMAL LOGGER CONTROLS
Channel Scan, Mode Scan rate, Interval Readings/channel, Paper Advance, Print, Pause, Manual, Run, Reset, Output.

KEY LOCKS
Lock Power On and Lock programming key Off to prevent tampering after set-up.

OUTPUT DEVICE:
Memory only; TTY, Cassette, CRT, Internal Printer, Mag Tape, and IEEE Interface

OPTIONAL ALPHANUMERIC PRINTER
Lists data at 3/sec. with all actual engineering units.

LIGHTED PUSHBUTTON KEYPADS


EXPANSION
EXPANSION
MODEL

BATTERY SWITCH

POWER

CIRCUIT BREAKER RESET

I/O OPTION MODULES SIGNAL CONDITIONERS AND MUX CARDS

Rear View
Figure 2

APPLE

SPECIFICATIONS

Z 8080 EPROM READY AC MEM

Microprocessor Memory:	8-bit 8080 Type U.V. Erasable PROM, TTL RAM or CMOS RAM with battery READ ONLY MEM
Multiplexers:	3-wire with switching of (+)(-) (shield) using tree relay, 6-wire with switching of (+)(-) (shield) for excitation and (+)(-) (shield) for signal using two tree relays. Input multiplexers also available to meet 1500V SWC IEEE specifications.
Signal Conditioning:	6-wire switched signal conditioner technology.
A to D Converter:	Dual integrating 20 channel per second, 16 bits with automatic zero and span compensation.
Peripherals:	Dual port RS 232 and 20 ma current loop interface option for printers, tape drives, CRT's, modems.
Alarm/Control Outputs:	Reed Relay-0.5 Amp, Triac-2 Amp, Relay-5 Amp. Outputs also available to meet 1500V SWC IEEE specifications.
Power Supply:	Self-contained, requires 115VAC, 60 Hz @ 3 Amps.
Physical:	8 3/4" High x 19" wide (for rack mount) x 24" deep. Approximately 80 pounds, depending on options.
Battery Backup:	Up to 30 days for CMOS memory.

A/D (ANALOG TO DIGITAL) CONVERTER

CMR	120db at DC infinite at 60 Hz or multiples thereof, 1KΩ Source Unbalance.
NMR	60db at line frequency.
Common Mode Voltage	250 Volts peak
Isolation Impedance	$>10^9\Omega$
Differential Impedance	$>10^9\Omega$
Type	Floating, guarded differential dual-slope integration, digital auto-zero and auto-span.
Resolution	32,000 counts (16 bits 2's complement binary)

Multi-range

FULL SCALE VOLTS	A/D RESOLUTION	DISPLAY
±12V	400µV	12.000
±6V	200µV	6.000
±1.5V	50µV	1.5000
±600MV	20µV	600.0
±300MV	10µV	300.00
±150MV	5µV	150.00
±60MV	2µV	60.00
±30MV	1µV	30.000
±15MV	0.5µV	15.000

User pick 8 in succession

Accuracy	±0.2% reading ±0.01% range ±5µV 17°C to 37°C
Voltage between any two inputs	250V (DC + peak AC)
Conversion Speed	20/second

I. INTRODUCTION

Model 2760, 2762 and SY 76 data loggers are packaged for shipment in a sturdy fibre box especially designed for the purpose, with shock absorbing material surrounding the unit. Do not discard this special packaging until the unit has been successfully set up and programmed. Use only the original FXS packaging to return the unit for repair unless instructed otherwise by FXS.

Every effort has been made in design to create a rugged mechanical assembly capable of enduring shipping and handling abuse. The logger is a precision instrument, however, and should always be handled with care.

The information contained in this manual will allow a non-computer trained technician to set up and operate a Logger Mainframe as it is received from FXS. For information on optional equipment expansion units, technical data, wire lists, and schematics for maintenance, write to the Sales Department, FX Systems Corporation, C.P.O. Box 1818, Kingston, New York 12401.

CAUTION: DO NOT ADJUST PC MOUNTED DIGITAL SWITCHES LOCATED ON VARIOUS MODULES AND CIRCUITS FOUND WITHIN THE UNIT. THESE ARE FACTORY SET AND USED TO CONFIGURE THE LOGGER TO YOUR PARTICULAR APPLICATION REQUIREMENT. CHANGING ANY OF THESE SWITCH POSITIONS CAN MAKE YOUR UNIT INOPERATIVE.

Shipping Damage

Inspect shipping container for damages and note especially whether the unit has been mishandled in shipment for possible claim to your carrier should the unit itself be damaged. Unpack the unit and check carefully for shipping damage. Try all circuit cards in their slots to assure they line up with the connectors on the main circuit board. Check the alignment of the front panel to assure the panel will open and close without serious binding. Look also for other obvious structural damage to the unit before turning on power.

Before operating the unit, please read the following General Description and the section on System Operation in the front of the manual prior to the Installation section.

CAUTION: DO NOT ATTEMPT TO OPEN THE FRONT PANEL WITHOUT FIRST REMOVING THE PRINTER. SEE THE PRINTER SECTION FOR INSTRUCTIONS ON REMOVING THIS UNIT WHICH IS MOUNTED TO THE INSTRUMENT PANEL.

II. DESCRIPTION

A. General

Models 2760 & 2762 and SY 76 are basically the same eight (8) bit microprocessor based, bus oriented data loggers designed especially for the test laboratory and the process plant. Its basic architecture is like that of a general purpose minicomputer rather than that of a dedicated data logger. This provides unusual freedom of choice for channel expansion, optional features, expanded memory, calculations, peripherals, and control functions.

A.1 They are complete self-contained instrumentation systems in a box approximately 8 $^3/_4$" high x 24" deep x 19" wide, weighing approximately 80 lbs.

A.2 They are constructed around the universal bus structure packaging technique which means any card in the unit will work properly in any card slot, either in the front or the rear of the unit, provided the associated cables, if any, permit proper mating.

A.3 All functional circuitry is provided on universal completely interchangeable, plug-in modules.

A.4 The Logger may have a self-contained full ASCII set dot matrix printer (Models 2760 and SY 76 with printer).

A.5 Although standard system configurations are available (denoted by model number), wide functional latitude exists for custom configurations, since system operation is determined by programs stored in erasable P/ROM memory.

A.6 The Logger is configured with 6-wire switched signal conditioner technology. This can utilize either Series 2000 shared signal conditioning for process monitoring or B & F signal conditioning of the one-on-one type for the strain laboratory.

A.7 The Logger will accept any of the four (4) standard types of analog multiplexer input cards, intermixed in any order:

- A. Low level isolated relay
- B. Precision isolated isothermal relay
- C. Self-loaded isolated 4-20 ma. relay

A. General (continued)

A.8 The Logger incorporates automatic self-calibration features traceable to the NBS.

A.9 The Logger provides universal type connection in that any sensor may be connected to any input and defined after connection. Up to 32 definitions of input type are available. These include, but are not limited to:

- A.9.1 Type T,J,K,E,R, and S thermocouples, readout in °F or °C.
- A.9.2 RTD
- A.9.3 Strain Gage (4-wire bridge)
- A.9.4 DC volts (4 ranges)
- A.9.5 DC amps (6 ranges)
- A.9.6 AC volts
- A.9.7 AC amps
- A.9.8 Power (single phase)
- A.9.9 Special calculations (such as square root)
- A.9.10 Special linearizations (such as radiometers)
- A.9.11 Special cross channel calculations
- A.9.12 Auto-Cal functions (strain gages)
- A.9.13 Contact integrity
- A.9.14 AC detection

A.10 The Logger may have any of three (3) available A/D converter assemblies for a more flexible cost/performance match.

A.11 The Logger accepts the following I/O modules:

- A.11.1 Serial Interface
- A.11.2 Tape Drive
- A.11.3 Digital Input
- A.11.4 Digital Output
- A.11.5 Signal Conditioner Control
- A.11.6 Multiplexer Control
- A.11.7 Alarm Output
- A.11.8 Relay Output
- A.11.9 Relay Input

A. General (continued)

A.12 Multiple limit configurations are available; group assignment and channel assignment.

A.13 In the Logger, the number of analog inputs available in the mainframe is determined by the number of I/O and signal conditioners installed. Nine (9) slots are available for these functions. One slot is committed for signal conditioning so the following configurations are available:

NUMBER OF I/O DEVICE AND SIGNAL CONDITIONER CARDS IN MAINFRAME	MAXIMUM ANALOG INPUT CHANNELS IN MAINFRAME
0	80
1	80
2	70
3	60
4	50
5	40
6	30
7	20
8	10
9	0

A.14 Analog input capacity may be expanded to 1000 inputs by use of Model 2530 Analog Multiplexers for process monitoring or B & F Scanners for the strain laboratory.

A.15 Signal conditioning capacity may be expanded by use of Model 2610 Signal Conditioners, or B & F standard signal conditioning.

B. The Basic 2760, 2762 and SY 76 Mainframe Structure

The Logger is centered around the INTEL 8080 microprocessor. This device is combined with a mixture of ROM (Read Only Memory), RAM (Random Access Memory) and peripheral interfaces to comprise a microcomputer.

The ROM memory stores that portion of the system program that is to remain fixed. This includes the system Operating sequence, Control Panel communication, Multiplexer and A/D Converter control, printer control and the equations and algorithm necessary to convert the incoming voltages to meaningful engineering or process data. This memory is nonvolatile, guaranteeing program integrity.

The RAM memory is used to store all user defined parameters such as channel identification, limit assignment and system operating modes. The instrument may contain batteries (option) which preserve the contents of this memory through power failures of 30 days or more. The battery switch is located on the rear power panel of the unit.

The Logger is constructed utilizing a universal bus structure. Because of this, any option can be plugged in at any location. Features can be added to the system easily and economically even when in the field by part substitution and addition.

The Logger has a Pushbutton Operator Station mounted directly on the front of the chassis. This contains the necessary pushbuttons, indicators, keyboard and decimal readouts to provide for operator set-up and control of instrument operation. The operation of this panel will be discussed in detail in section V of this manual.

The Logger may be configured with a number of available I/O function cards which are described separately.

The Logger is always configured with analog subsystems cards which provide the basic functions of input multiplexing, signal conditioning, and A/D conversion. The available function cards which provide these features are described separately.

III SYSTEM OPERATION

A. General

The heart of the Logger is the CPU which contains a microprocessor. All system operations are performed by a control program that is placed in this device at the factory before shipment.

B. Basic Data Flow

The Logger can monitor both discrete (on/off) signals and continuous (analog) signals. The Set-Up Panel is used to specify to the system what type of input (input type) is attached to each channel. These input types are defined at the factory or in the field if the instrument is equipped with the necessary software.

When a channel is accessed for data, the system first reads the input type from the user RAM memory. If it is not to be skipped, the parameters for the input type are obtained from the ROM memory. This determines how the instrument will handle the particular channel data. Included in this definition are the signal conditioner to be used, the A/D converter gain, scale factors and linearization, and the printed engineering units and decimal point location. The system then sends a code to the Multiplexer to attach the point to the signal conditioner bus and a code to the signal conditioner system selecting the appropriate signal conditioner. After allowing for the appropriate signal conditioner settling time, the A/D converter is given a convert signal. The data is then converted and read by the CPU as a 2's complement binary number.

The resulting number is scaled, offset and otherwise mathematically operated on and converted to a value expressed in engineering units. This value then may be checked against user defined limits, printed or sent to a computer, as predetermined by the user in system set-up.

C. Control of Instrument Operation

Time is the primary element that controls the Logger operation. The system has a built-in real time clock derived from the crystal oscillator of the CPU. Time is kept to a 1 second resolution on a 24 hour or military basis. The calendar date is incremented each 24 hour period. During system set-up, the user defines the times at which different functions such as normal logging, alarm logging and alarm scanning should occur. When the times elapse, the system executes the programmed functions.

D. Internal Printer (Logging)

When the Logger is supplied with an internal printer, a dot matrix printer is provided which accommodates the full units coding option. This printer is able to form all characters of the standard ASCII set, utilizing 5 x 7 dot matrix printing on ordinary paper. Operating speed is normally three (3) channels per second. Paper is supplied in 82 foot rolls, 2 $^3/_8$ inches wide. Printing is performed at 6 lines per inch.

Printer format is shown below. For illustration, the standard units codes are included:

```
 11  12.000  VOLT
 10  6.000   VOLT
  9  1.5000  VOLT
  8  600.0   MV
  7  300.00  MV
  6  150.00  MV
  5  60.00   MV
  4  30.000  MV
  3  15.000  MV
  2  1391.0  DEGF
  1  0000    UE
  0  OPEN

LAST CHANNEL:    11
FIRST CHANNEL:    0

IC1613:   SKIPPED
EXTERNAL: SKIPPED
INTERNAL:   0- 11
MAN:   2315
DATE: 01/25/79
TIME: 09:42:03
```

E. System Expansion

The Logger may be expanded to up to 1000 analog points by installing an AMUX Interface in one of the rear panel I/O slots and attaching up to ten (10) Analog Multiplexer Assemblies or by plugging in the B & F universal interface and associated B & F scanners and conditioning. In addition, up to 32 different Series 2000 Signal Conditioners can be handled by the system by attaching up to three (3) Signal Conditioner Assemblies. As an alternate, all three interfaces could be attached providing a system with a mixture of B & F and Series 2000 conditioning and scanners.

IV. INSTALLATION

A. General Cabling Recommendations

Model 2760 and 2762 Loggers offer a high degree of immunity to the electrical noise normally associated with the industrial environment. However, the following recommended practices should be followed to avoid placing unnecessarily stringent requirements on the internal circuitry:

A.1 All models are equipped with 3-wire grounded AC power cords. These must be connected to a proper source of AC single phase power, having a good quality earth ground on the third pin. Refer to power panel at the rear of the unit for the proper voltage and frequency.

A.2 Signal inputs are to be connected per the recommended practice for the particular sensor type.

A.3 Cabling between an expansion type (external) MUX or conditioning chassis for distances greater than twelve (12) feet should be twisted pair encased in metal conduit or shielded cable, having a good quality earth ground.

A.4 Cabling between expansion chassis for distances greater than fifty (50) feet, or where 110VAC is contained, or may be contained by signal (analog) cabling, shall be separated into analog and digital cabling. Such cable groups shall be of twisted pairs individually encased in metal conduit having a good quality earth ground.

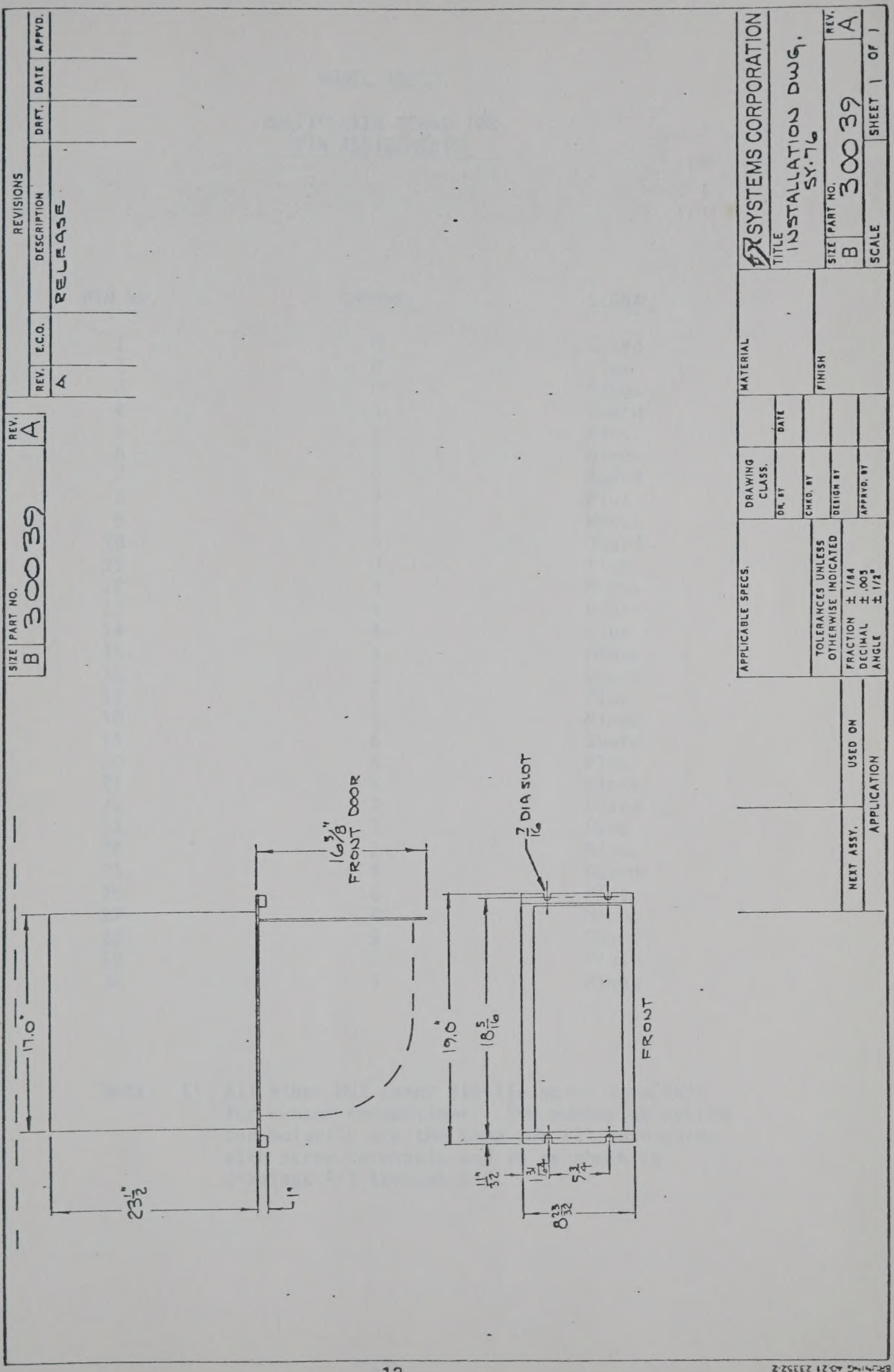
A.5 In no case is such conduit to contain wiring which contains or may contain, signals exhibiting AC waveforms greater than 5V PP at any frequency, or DC voltages greater than ±125 VDC with respect to earth ground.

B. Wiring of Low Level Multiplexers-Model 15213, 15231-1, 15231-11, 30294-1, 30294-11

The following figures, drawings and diagrams explain how to wire the above Multiplexers to any of the following sensors or signal types:

Thermocouples: Types S,E,R,K,T,J (see figure A-1 for wiring to the above listed MUX cards.)
AC Power
AC Voltage
4-Arm Bridge
AC Current
DC Current, internal resistance
DC Voltage
6-Wire RTD
3-Wire RTD

FIGURE -1-

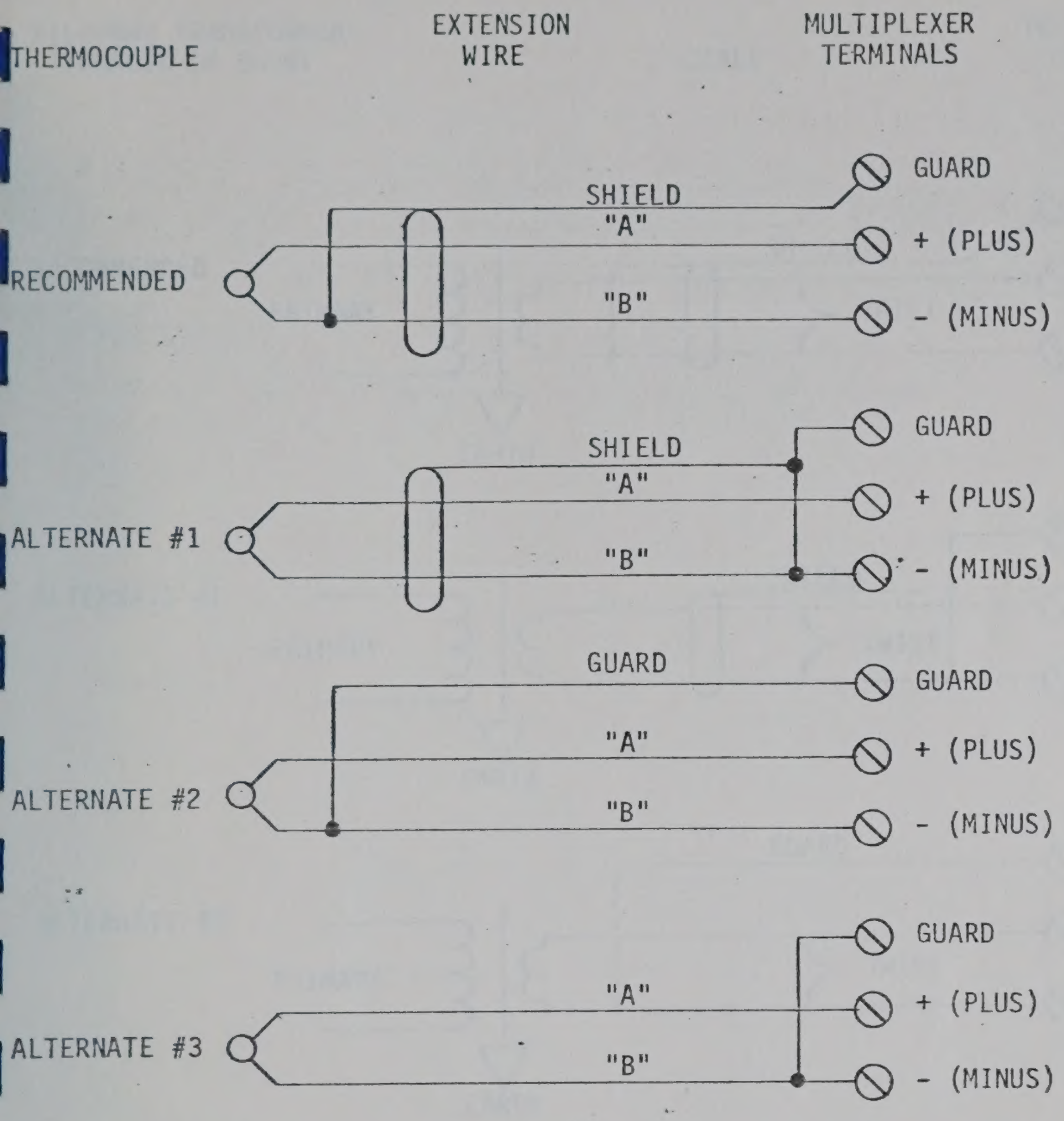

REVISIONS
REV.
E.C.O.
DESCRIPTION
DRFT.
DATE
APPVD.
A
RELEASE
SIZE B
PART NO. 30039
REV. A
17.0"
23 1/32"
1"
16 3/8" FRONT DOOR
7/16 DIA SLOT
19.0"
18 5/16
11/32
1 31/64
5 1/4
8 23/32
FRONT
SYSTEMS CORPORATION
TITLE INSTALLATION DWG, SY.76
SIZE B
PART NO. 30039
REV. A
SCALE
SHEET 1 OF 1
MATERIAL
FINISH
APPLICABLE SPECS.
DRAWING CLASS.
DR. BY
DATE
CHKD. BY
DESIGN BY
APPRVD. BY
TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°
NEXT ASSY.
USED ON
APPLICATION
BRUNING 40-21 23352-2

MODEL 15213

MULTIPLEXER CONNECTOR PIN ASSIGNMENTS

PIN NO.	CHANNEL	SIGNAL
1	0	Guard
2	0	Plus
3	0	Minus
4	1	Guard
5	1	Plus
6	1	Minus
7	2	Guard
8	2	Plus
9	2	Minus
10	3	Guard
11	3	Plus
12	3	Minus
13	4	Guard
14	4	Plus
15	4	Minus
16	5	Guard
17	5	Plus
18	5	Minus
19	6	Guard
20	6	Plus
21	6	Minus
22	7	Guard
23	7	Plus
24	7	Minus
25	8	Guard
26	8	Plus
27	8	Minus
28	9	Guard
29	9	Plus
30	9	Minus

Note: 1) All other MUX cards utilize screw terminals for sensor connections. The numbering system and polarity are the same for all such cards with screw terminals and is as shown in drawings A-1 through A-5.


THERMOCOUPLE
EXTENSION WIRE
MULTIPLEXER TERMINALS
RECOMMENDED
SHIELD
"A"
"B"
GUARD
+ (PLUS)
- (MINUS)
ALTERNATE #1
SHIELD
"A"
"B"
GUARD
+ (PLUS)
- (MINUS)
ALTERNATE #2
GUARD
"A"
"B"
GUARD
+ (PLUS)
- (MINUS)
ALTERNATE #3
"A"
"B"
GUARD
+ (PLUS)
- (MINUS)

TYPE	WIRE "A"	WIRE "B"
E	CHROMEL	CONSTANTAN
J	IRON	CONSTANTAN
K	CHROMEL	ALUMEL
R	PLATINUM/RHODIUM	PLATINUM
S	PLATINUM/RHODIUM	PLATINUM
T	COPPER	CONSTANTAN

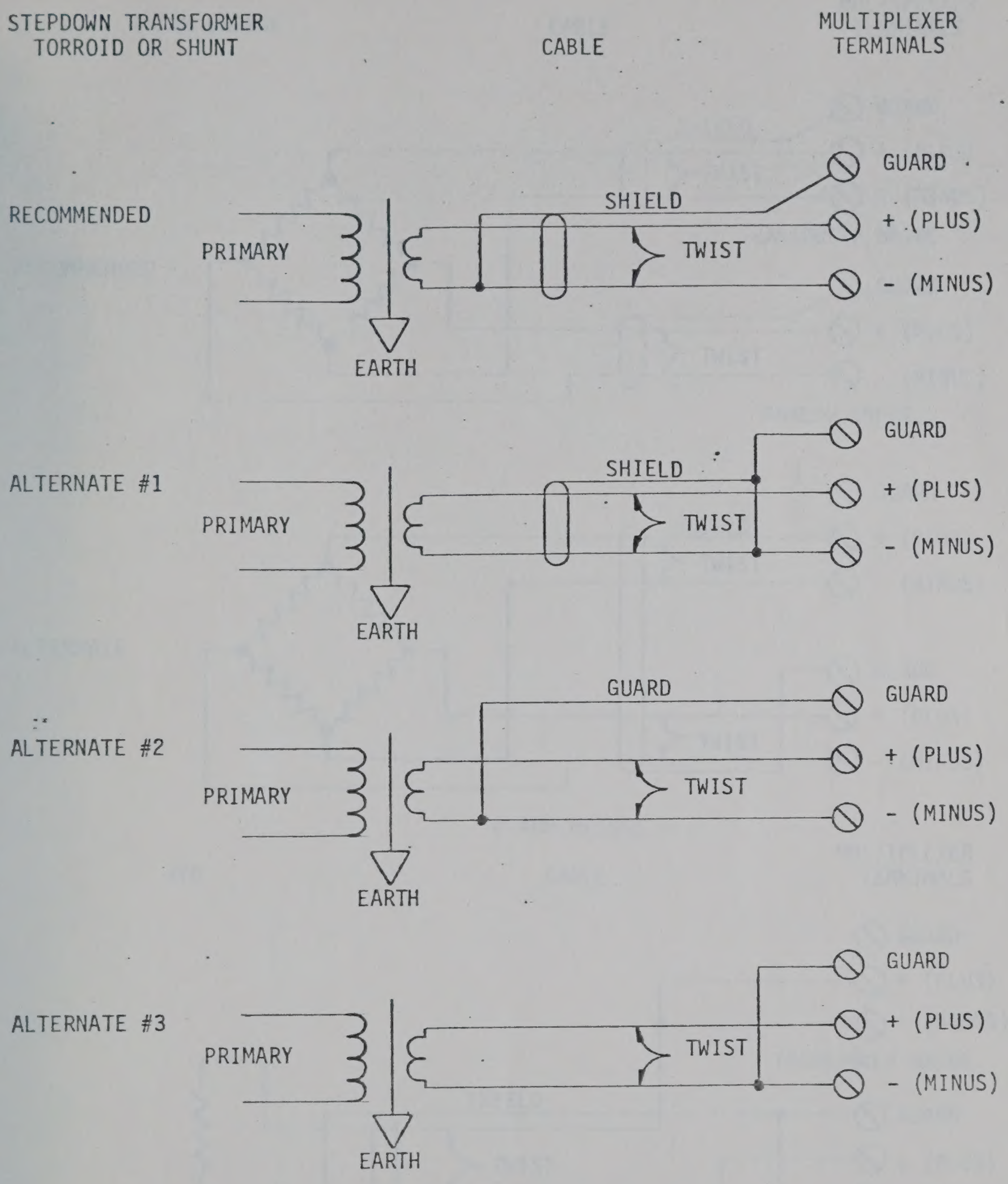
X SYSTEMS CORPORATION

DIVISION

ITLE

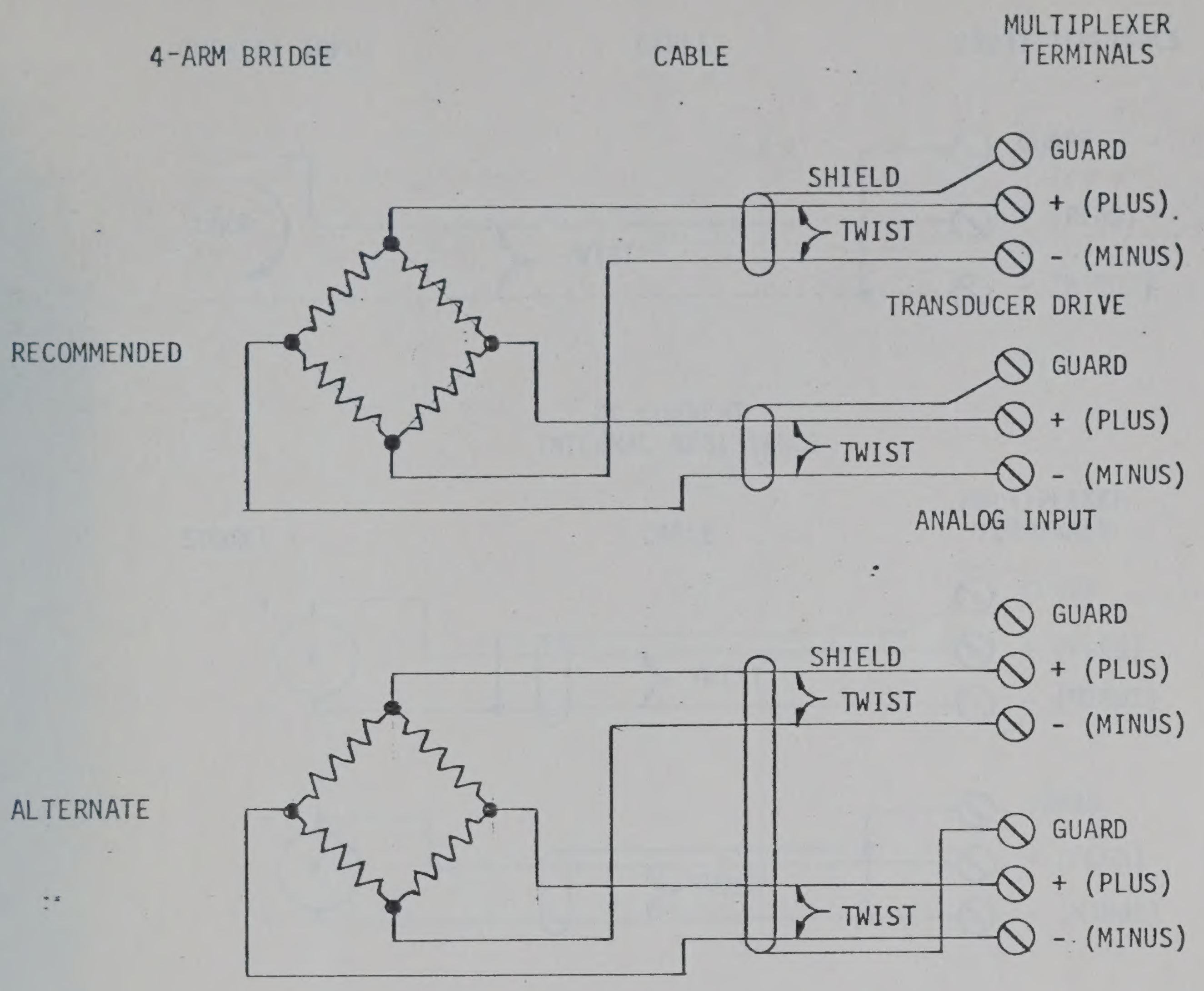
TYPES E, J, K, R, S, T THERMOCOUPLES

DR. BY	DATE	DWG NO.
APPRVD. BY	DATE	A - 1
ECN	REV	SHEET OF

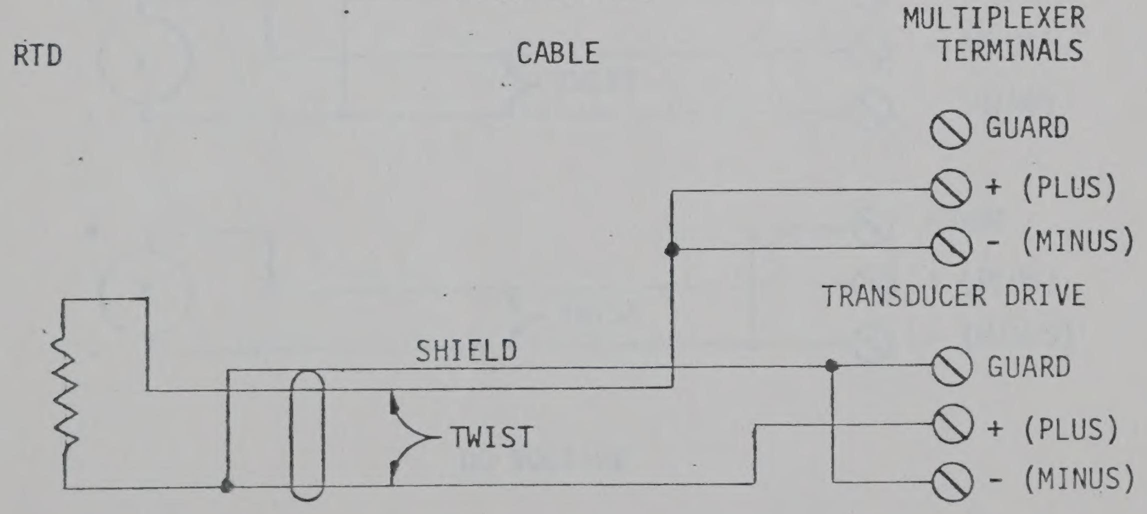

STEPDOWN TRANSFORMER
TORROID OR SHUNT
CABLE
MULTIPLEXER
TERMINALS
RECOMMENDED
PRIMARY
EARTH
SHIELD
TWIST
GUARD
+ (PLUS)
- (MINUS)
ALTERNATE #1
PRIMARY
EARTH
SHIELD
TWIST
GUARD
+ (PLUS)
- (MINUS)
ALTERNATE #2
PRIMARY
EARTH
GUARD
TWIST
GUARD
+ (PLUS)
- (MINUS)
ALTERNATE #3
PRIMARY
EARTH
TWIST
GUARD
+ (PLUS)
- (MINUS)

X SYSTEMS CORPORATION	DIVISION		
ITLE AC VOLTAGE OR CURRENT	DR. BY	DATE	DWG NO. A - 2
	APPRVD. BY	DATE	
	ECN	REV	SHEET OF

XS 6000


4-ARM BRIDGE
CABLE
MULTIPLEXER TERMINALS
SHIELD
GUARD
+ (PLUS)
TWIST
- (MINUS)
TRANSDUCER DRIVE
RECOMMENDED
GUARD
+ (PLUS)
TWIST
- (MINUS)
ANALOG INPUT
GUARD
SHIELD
+ (PLUS)
TWIST
- (MINUS)
ALTERNATE
GUARD
+ (PLUS)
TWIST
- (MINUS)

4-ARM BRIDGE


RTD
CABLE
MULTIPLEXER TERMINALS
GUARD
+ (PLUS)
- (MINUS)
TRANSDUCER DRIVE
SHIELD
GUARD
TWIST
+ (PLUS)
- (MINUS)
ANALOG INPUT

3-WIRE RTD

FX SYSTEMS CORPORATION

DIVISION

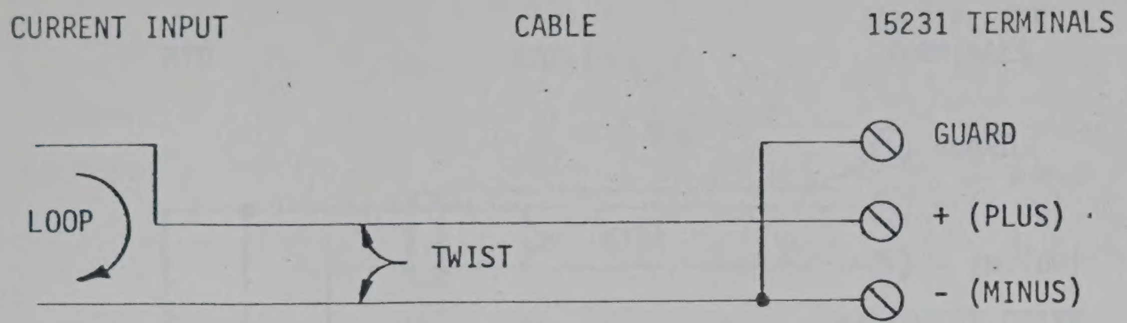
TITLE 3-WIRE RTD AND 4-ARM BRIDGE

DR. BY **DATE**

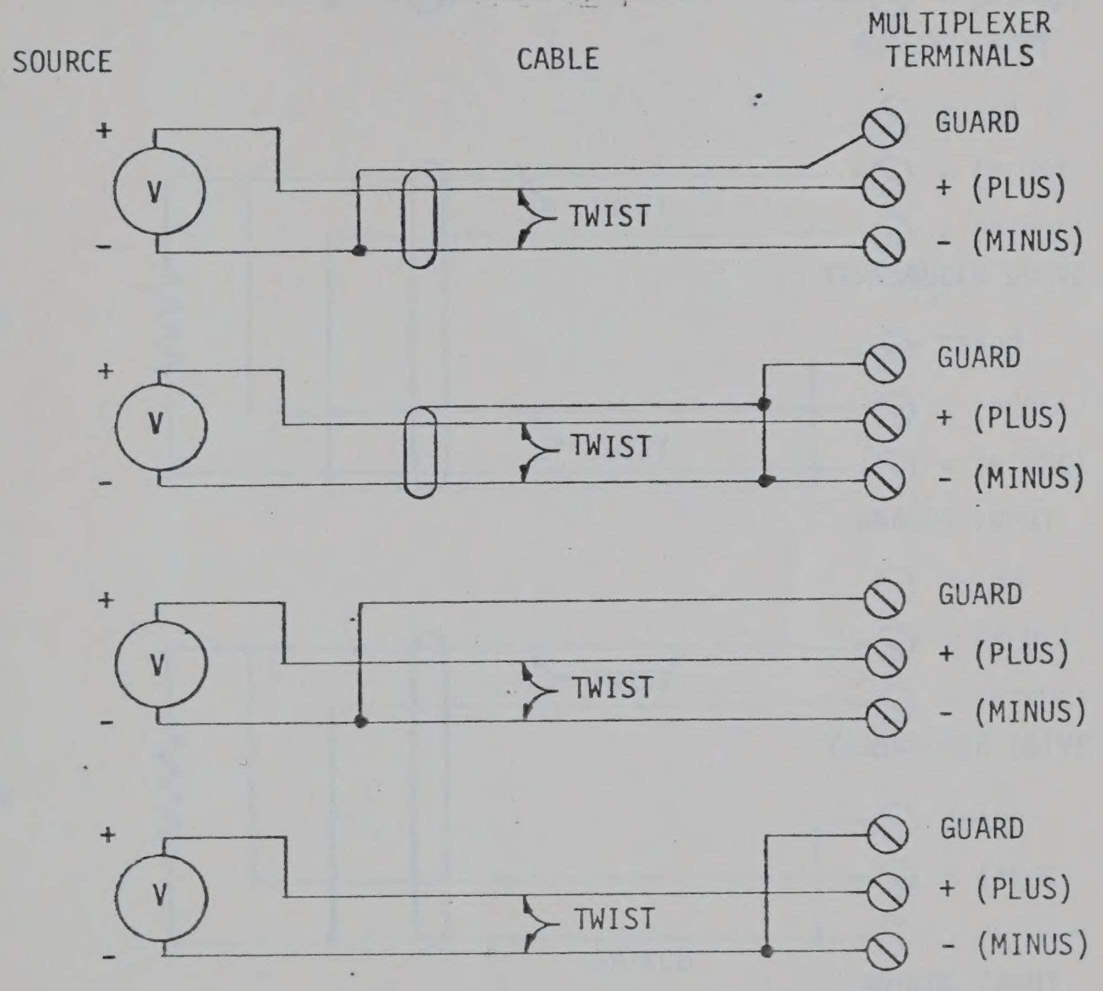
APPRVD. BY **DATE**

DWG NO. A - 3

ECN **REV** **SHEET** **OF**

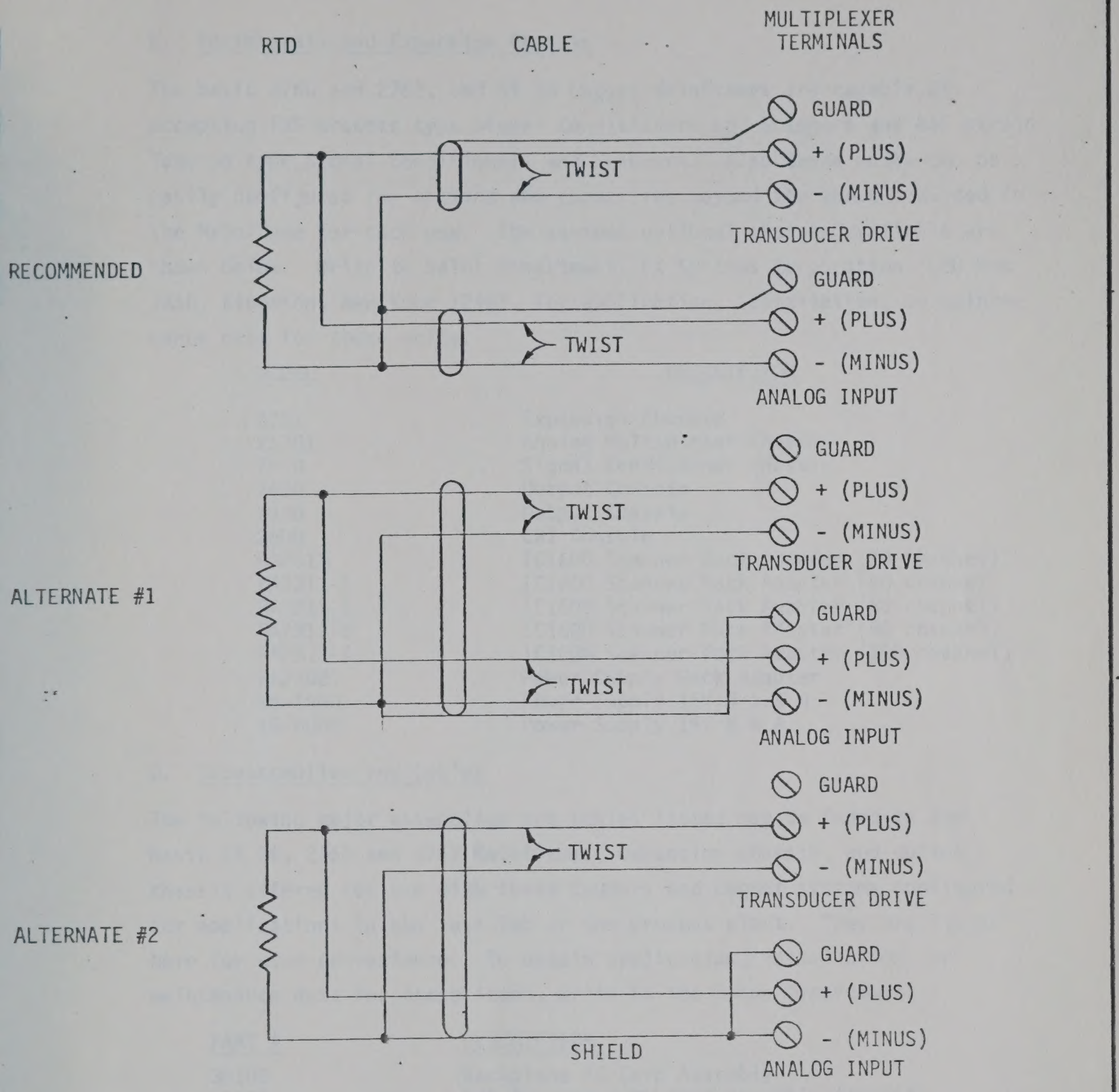

CURRENT INPUT
CABLE
15231 TERMINALS
LOOP
TWIST
GUARD
+ (PLUS)
- (MINUS)

DC CURRENT
INTERNAL RESISTANCE


SOURCE
CABLE
MULTIPLEXER TERMINALS
+
V
-
TWIST
GUARD
+ (PLUS)
- (MINUS)
+
V
-
TWIST
GUARD
+ (PLUS)
- (MINUS)
+
V
-
TWIST
GUARD
+ (PLUS)
- (MINUS)
+
V
-
TWIST
GUARD
+ (PLUS)
- (MINUS)

DC VOLTAGE

X SYSTEMS CORPORATION	DIVISION		
TLE	DR. BY	DATE	DWG NO.
DC CURRENT AND DC VOLTAGE	APPRVD. BY	DATE	A - 4
	ECN	REV	SHEET OF



RTD
CABLE
MULTIPLEXER TERMINALS
RECOMMENDED
GUARD
+ (PLUS)
TWIST
- (MINUS)
TRANSDUCER DRIVE
GUARD
+ (PLUS)
TWIST
- (MINUS)
ANALOG INPUT
ALTERNATE #1
GUARD
+ (PLUS)
TWIST
- (MINUS)
TRANSDUCER DRIVE
GUARD
+ (PLUS)
TWIST
- (MINUS)
ANALOG INPUT
ALTERNATE #2
GUARD
+ (PLUS)
TWIST
- (MINUS)
TRANSDUCER DRIVE
GUARD
+ (PLUS)
- (MINUS)
SHIELD
ANALOG INPUT

X SYSTEMS CORPORATION	DIVISION		
TLE 6-WIRE RTD	DR. BY	DATE	DWG NO. A - 5
	APPRVD. BY	DATE	
	ECN	REV	SHEET OF

C. Peripherals and Expansion Chassis

The basic 2760 and 2762, and SY 76 Logger Mainframes are capable of accepting FXS process type Signal Conditioners and Scanners and B&F strain logging type Signal Conditioners and Scanners. Also these units can be easily configured for options and capacities beyond the space provided in the Mainframe for such use. The various optional chassis available are shown below. Write to Sales Department, FX Systems Corporation, CPO Box 1818, Kingston, New York 12401, for application, installation, or maintenance data for these units.

MODEL	DESCRIPTION
2761	Expansion Chassis
25301	Analog Multiplexer Chassis
2610	Signal Conditioner Chassis
2620	Output Chassis
2950	Output Chassis
2800	CRT Console
RA2311	IC1600 Scanner Rack Adapter (20 channel)
RA2311-1	IC1600 Scanner Rack Adapter (40 channel)
RA2311-2	IC1600 Scanner Rack Adapter (60 channel)
RA2311-3	IC1600 Scanner Rack Adapter (80 channel)
RA2311-4	IC1600 Scanner Rack Adapter (100 channel)
RA2308	Power Supply Rack Adapter
15-1500	Power Supply 15V @ 1.5 A
15-6000	Power Supply 15V @ 6 A

D. Subassemblies and Cables

The following major assemblies and cables listed may be found in the basic SY 76, 2760 and 2762 Mainframes, expansion chassis, and option chassis offered for use with these Loggers and Logger systems configured for applications in the test lab or the process plant. They are listed here for user convenience. To obtain application, installation, or maintenance data for these items, write to the Sales Department.

PART #	DESCRIPTION
30102	Backplane PC Card Assembly
30108	A/D Converter PC Card Assembly (16-bit)
30204	CPU PC Card Assembly
30205	2K CMOS RAM PC Card Assembly
30206	4K TTL RAM PC Card Assembly
30207	8K P/ROM PC Card Assembly
30209	A/D Controller PC Card Assembly
30216	6-Wire Resistance Preamp PC Card Assembly
30218	Watchdog Timer PC Card Assembly
30220	DOT Matrix Printer Assembly
30221	Printer Interface PC Card Assembly
30222	Battery Assembly

D. Subassemblies and Cables (continued)

PART #	DESCRIPTION
30232	4- & 6-Wire Mux PC Card Assembly w/CAL
30238	Dual Async PC Card Assembly
30242	Contact Output PC Card Assembly (8-bit)
30244	Pre-Scaler PC Card Assembly
30246	Analog Interface PC Card Assembly
30252	Driver PC Card Assembly
30258	Service Extender PC Card Assembly
30260	Counter/Timer PC Card Assembly
30275	APU PC Card Assembly (32-bit)
30292	Analog Selector PC Card Assembly
30294-01	6-Wire Mux PC Card Assembly
30294-11	3-Wire Mux PC Card Assembly
30310	Front Panel Interface PC Card Assembly
30311	Front Panel Interface PC Card Assembly
30312	Display PC Card Assembly
30313	Thumbwheel PC Card Assembly
30314	Keyboard PC Card Assembly (12)
30315	Keyboard PC Card Assembly (6)

CABLE ASSEMBLIES

30219	30217/2900 (Power Output)
30226	30292/RA2311 Digital
30227	30246/RZ2311 Analog
30229	15215/RA2311 Analog
30230	30252/2900 Digital
30231	15-1500/RA2311
30239	30238/2310 (Printer)
30241	30238/Techtran
30243	30238/Decwriter
30245	30238/ASR-33
30249	30238/2800 (CRT)
30251	30246/15215 Analog
30253	30252/15217 Digital
30254	30252/16141 Digital
30255	30246/16139 Analog
30261	30252/16202 Digital
30271	15-6000/RA2311
3-279	Expansion (30278/30280)

E. Before proceeding to the next section where power will be applied for the first time, check the unit carefully to assure all circuit cards in back are firmly seated in their connectors. After this has been accomplished, remove the Printer (if an internal printer is installed) by loosening the two (2) finger screws on the printer panel. When loose (not removed), pull the modular printer assembly forward, withdrawing it completely from the panel of the Logger. Now the panel latch may be released by lifting, and used as a handle to open the panel to expose the circuit cards mounted in the front. Again, check that all cards are firmly seated, and also check to see that all ribbon cables connectors are seated in their sockets.

CAUTION:

Serious damage can result if cables are improperly connected. Cable connectors and card connector sockets are numbered, and the proper alignment is shown by arrows molded into the assemblies, as well as black stripes next to the connector number which should align with similar bars on the card mounted connector.

The printer cable connector should be mated with the card edge connector so that the numbers shown match properly.

V. SYSTEM SET-UP

A. INTRODUCTION

The device you are about to become familiar with is an extremely powerful medium speed computer which has been optimized for I/O applications. Depending on the configuration supplied, it may contain from three (3) to ten (10) microporcessors running in parallel. Most of these processors have a single dedicated function (task). However, the master CPU (Central Processing Unit) runs a full interrupt-driven multi-tasking operating system as is found in large minicomputers. The machine itself is therefore capable of doing more than 256 simultaneous operations (tasks). The machine is supplied with a pushbutton/display type operator interface panel and a data logger software package. If you are at all familiar with data loggers, you will find that the normal data logger functions are a small subset of the features available with this machine. Although every attempt has been made to make the machine easy to use and understand, power and flexibility are purchased at the price of increased operator interaction as regards definitions and orders to the machine. Please remember that computers must be told exactly what to do and how to do it. We strongly recommend that you become thoroughly familiar with the following sections before using the machine.

B. POWER-UP SEQUENCE

NOTE: Read the previous page (Section IV, paragraph E) before proceeding with this Power-Up Sequence.

Turn the front panel keylock to the ENABLE position and the power keylock to the ON position.

The RESET light should come on, otherwise all other displays should be off. Every time the system is powered up the system generation modes (99, 98, and 97) must be executed in sequence before any other operation is allowed. The entries for the FIRST and LAST channel thumbwheels for your machine for each of these modes have been provided as part of the configuration documentation. The following procedural description, however, is adequate for recalculation of these entries should you wish to expand or contract your machine.

NOTE: Modes 99, 98, and 97 may be bypassed by use of the bootstrap load feature (E.3) in machines so equipped.

B.1 Mode 99 (Internal Channels)

The system may be supplied with internal 302xx analog/contact input multiplexer cards, or they may have been added or deleted in the field. Set the MODE thumbwheel to 99. If no such cards are present in the rear I/O slots of the mainframe, execute the following key sequence:

INPUT/SKIP/LOAD

If the cards are present, set the FIRST CHANNEL thumbwheel to 000. Determine the number of channels represented by the 302xx cards (# of cards x 10). Subtract one (1) from the number of channels and set this number in the LAST CHANNEL thumbwheel:

# of channels	Last
80	079
70	069
60	059
50	049
40	039
30	029
20	019
10	009

Execute the following sequence: INPUT/DATA/LOAD

B.2 Mode 98 (Non-Strain External Channels)

The system may be supplied with Series 2530 or 2950 analog/contact input multiplexer chassis. Set the MODE thumbwheel to 98. If no such chassis are present in the system, execute the following key sequence:

INPUT/SKIP/LOAD

If expansion chassis are present in the system, determine the number of 152xx or 295xx cards present and calculate the number of channels represented (# of cards x 10). Set the FIRST thumbwheel to 100. Add the number in the FIRST thumbwheel to the number of channels and subtract one (1). Set this result in the last thumbwheel. Examples:

22 = # of 152xx cards
FIRST = 100
# of 152xx cards x 10 = 22 x 10 = 220
220 = # of channels
FIRST + # of channels - 1 = 100 + 220 - 1 = 319
LAST = 319

Execute the following sequence: INPUT/DATA/LOAD

B.3 Mode 97 (External Strain Channel)

The system may be supplied with Series IC1613 strain gage conditioner/multiplexer cards. Set the MODE switch to 97. If no IC1613 cards are present in the system, execute the following key sequence:

INPUT/SKIP/LOAD

If the system contains IC1613 cards, determine the number of cards present and calculate the number of channels represented (# of cards x 10). Set the FIRST thumbwheel to the next channel above that used for the LAST in Modes 99 to 98. In the case of example B.2 above, the FIRST thumbwheel would be set to 320, since the LAST was 319. Add the number in the FIRST thumbwheel to the number of channels and subtract one (1). Set this result in the LAST thumbwheel. Example:

Settings as in B.2 above
4 = # of IC1613 cards
FIRST = 320 (next above previous LAST [319])
# of channels = 4 x 10 = 40
FIRST + # of channels - 1 = 320 + 40 - 1 = 359
LAST = 359

Execute the following sequence: INPUT/DATA/LOAD

As soon as Mode 97 has been executed, the MONITOR function begins to operate. The CHANNEL number displayed will be the lowest channel used in either modes 99, 98, or 97, in that order. If this is an initial powerup, the DATA displayed will in general be non-valid. If this is a restart the DATA displayed may or may not be valid. If this is an initial powerup, or the unit is not equipped with battery protected memory, please proceed to B.4.

B.4 Mode 01 (Prime Function)

Execution of the Prime Function is essential to proper operation of the system unless the unit is program loaded by the RAM Load feature (E.3). This step loads known values of channel parameters into user accessable memory. Key in the following sequence:

1. Set the MODE thumbwheel to 01.
2. Set the FIRST thumbwheel to 000.
3. Set the LAST thumbwheel to the highest number used in MODES 97, 98, or 99. In example B.3 above the LAST setting would be 359.

4. Execute the following key sequence: INPUT/DATA/LOAD

   This sequence primes all the system channels with the following parameters:

   SKIP STATUS = 1 (Log & test data)
   ALARM STATUS = 1 (Alarm on OPEN or LIMIT exceeded)
   RANGE STATUS = 06 (±12.000 volts)
   UNITS STATUS = 00
   HIGH LIMIT = +32000
   LOW LIMIT = -32000
   M = +01.000
   B = +00000

   As soon as the PRIME function has been executed the MONITOR function will display "valid" data. The DATA display will appear as:

   ±XX.XXX

   and the VOLTS legend will be lit.

B.5 Mode 00 (Time Set)

The machine contains an internal 24 hour real time and time of day clock. The current TIME may be observed in any mode by depressing the TIME key. The MONITOR function will be disabled, the CHANNEL display and legend blanked, and the TIME/DATA display switched to TIME:

XX : XX : XX
(hours:minutes:seconds)

If the CLEAR key is depressed the MONITOR is reactivated.

The TIME may be set in the following manner:

Set the MODE thumbwheel to 00.

Execute the following key sequence:

INPUT/TIME/(6 digit number)/LOAD

When the INPUT key is depressed the MONITOR function will be disabled and the display and legend blanked. Depressing the DATA TIME key has no visible effect except lighting the TIME key. When the first digit key is depressed the TIME display shows:

00:00:0X

B.5 Mode 00 (Time Set) (continued)

When the LOAD key is depressed, the MONITOR is reactivated.

B.6 Mode 00 (Date Set)

This machine contains a calendar function. The current DATE may be displayed in any mode by depressing the TIME key twice. The first depression of this key gives the TIME, and the second gives the DATE:

XX/XX/XX

(month: day: year)

Each depression of the TIME key switches the display between TIME and DATE. If the CLEAR key is depressed the MONITOR is reactivated.

The DATE may be set in the following manner:

Set the MODE thumbwheel to 00.

Execute the following key sequence:

INPUT/TIME/7/(6 digit number)/LOAD

When the INPUT key is depressed the MONITOR function will be disabled, and the DATA display and legend blanked. Depressing the TIME key has no visible effect except lighting the TIME key. When the 7 digit key is depressed, the displays come up as follows:

```
        DATE
          7       00 : 00 : 00
```

When the LOAD key is depressed, the MONITOR is reactivated.

B.7 Mode 02 (Constant Set)

Set the MODE thumbwheel to 02. The CHANNEL display and legend will be blanked, and the MONITOR disabled. The DATA display will show the value of the stored constant which is outputted as a "header" on every data record. This constant is for use by the operator in identifying data records. This constant may be altered by the following key sequence:

INPUT/DATA/(5 digit number)/LOAD

Return the MODE thumbwheel to 00.

B.8 Mode 00 (Output Device)

Although the Output Device may be selected at any time the unit is not in RUN, a selection should be made with the OUTPUT thumbwheel before proceeding further:

B.8 Mode 00 (Output Device) (continued)

OUTPUT	DEVICE
0	Memory Only
1	Internal Printer
2	Cassette
3	TTY
4	Not Assigned
5	"
6	"
7	"
8	"
9	"

B.9 Mode 11 (Configuration List)

This MODE will provide a hard or other copy of the system configuration including the set parameters for all channels between the FIRST and LAST thumbwheel settings on the selected Output Device by depressing the RUN key. Such a listing may be made at any time the unit is not in RUN, and is extremely helpful in avoiding operator confusion. A sample listing is shown in Figure B.9.1.

C. CHANNEL PARAMETER SETUP (MODE 00)

C.1 Channel Access

A channel may be accessed in any of three ways:

C.1.1 MANUAL

Repeatedly operate the MANUAL pushbutton until the desired channel appears in the display.

C.1.2 FIRST

Set the desired channel on the FIRST thumbwheel and depress the RESET key, if in the RUN condition.

C.1.3 INPUT

Use the keyboard in the following sequence:

INPUT/CHANNEL/(000-999)/LOAD

When the INPUT key is depressed the MONITOR function is disabled and the DATA display and legend are blanked. When the LOAD key is depressed the MONITOR function is reactivated on the "new" channel.

FIGURE B.9.1

CONFIGURATION LIST

```
           TIME:  08:17:30
           DATE:  12/08/78
           MAN:   01234
           INTERNAL:  000-009
           EXTERNAL:  100-109
           IC1613:    120-139
           FIRST CHANNEL:   0
           LAST CHANNEL:    9
Skip Code-------------------+++--Units Code
Alarm Code----------------+ |||  +Range Code
                          | |||  |
           CHANNEL - 000 A1S1U00R06
                         H+32000 - High Limit
                         L-32000 - Low Limit
                         M+01.000 - M (M(X) + B)
                         B+00000 - B (M(X) + B)
                     001 A1S1U00R06
                         H+32000
                         L-32000
                         M+01.000
                         B+00000
                     209 A1B1U00R24
                         H+32000
                         L-32000
                         S+01000 - Sensitivity (Auto Bal/Span)
                         Z+00010 - Zero Reading (Auto Bal/Span)
                         C+01500 - Cal Reading (Auto Bal/Span)
```

C.2 Skip

The data for a particular channel may be logged in different ways according to the value of the stored code:

C.2.1 0

Channel is deleted from scan and log (skipped).

C.2.2 1

No test is made for sensor integrity; data is logged normally.

C.2.3 2

Sensor integrity test is made:

If the input is closed and defined as a contact, the channel will be logged as closed.

If the input is closed and not defined as a contact, the normal data will be logged.

If the input is open, the channel will log as open.

C.2.4 3

Channel is deleted from scan and log (skipped) if open.

The value of this code for a particular channel may be examined by first accessing the channel by one of the methods described in C.1, and then depressing the SKIP key. When the SKIP key is depressed, the MONITOR function is disabled and the DATA display and legend are replaced by the stored value of the SKIP code. Depressing the CLEAR key reactivates the MONITOR.

The SKIP code may be altered by executing the following key sequence:

INPUT/SKIP/(0-3)/LOAD

When the INPUT key is depressed the MONITOR function is disabled and the DATA display and legend are blanked. When the LOAD key is depressed the MONITOR is reactivated.

C.3 Alarm

Channel data may cause alarms in different ways according to the value of the stored ALARM code.

C.3.1 0

Channel will not cause alarms.

C.3.2 1

If the input is open, or if the limits are exceeded, the channel will alarm.

C.3.3 2

If the input is shorted, or if the limits are exceeded, the channel will alarm.

C.3.4 3

If the data exceeds the set limits, the channel will alarm.

The value of this code for a particular channel may be examined by first accessing the channel by one of the methods described in C.1, and then depressing the ALARM key. When the ALARM key is depressed, the MONITOR function is disabled and the DATA display and legend are replaced by the stored value of the ALARM code. Depressing the CLEAR key reactivates the MONITOR.

The ALARM code may be altered by executing the following key sequence:

INPUT/ALARM/(0-3)/LOAD

When the INPUT key is depressed the MONITOR function is disabled and the DATA display and legend are blanked. When the LOAD key is depressed, the MONITOR is reactivated.

C.4 Units

The engineering units to be logged with the data of a particular channel is determined by the UNITS code. Backlit front panel engineering unit displays are provided as follows: DEGC, VOLT, MV, PSI, µE, EU, IN and LBS. The available UNITS codes are defined in Table C.4.1.

The value of this code for a particular channel may be examined by first accessing the channel by one of the methods described in C.1, and then depressing the UNITS key. When this key is depressed the MONITOR function is disabled and the DATA display and legend are replaced by the stored value of the UNITS code. Depressing the CLEAR key reactivates the MONITOR.

The UNITS code may be altered by executing the following key sequence:

INPUT/UNITS/(00-31)/LOAD

When the INPUT key is depressed the MONITOR function is disabled and the DATA display and legend are blanked. When the LOAD key is depressed the MONITOR is reactivated.

NOTE: 'EU' appears in the UNITS display on the front panel whenever the channel units programmed is other than those provided for in the logger display panel as described above.

C.5 Range

The data manipulation of a particular channel is determined by the RANGE code defined in Table C.5.1.

AVAILABLE UNITS CODES

CODE	OUTPUT	UNITS	COMMENTS
0			RANGE DETERMINANT
1		VRMS	(This means that in Code "0" the units are automatically assigned by the Range Code as shown at right→)
2		KV	
3		ARMS	
4		KA	
5		MA	
6		AMP	
7		WATT	
8		KW	
9		µE	
10		LBS	
11		KLBS	
12		GAL	
13		CFM	
14		RPM	
15		DEGC	
16		DEGF	
17		PSID	
18		PSIG	
19		PSIA	
20		HGA	
21		IN	
22		%	
23		KG	
24		MM	
25		CM	
26		FT	
27		GPM	
28		DEGK	
29			NOT ASSIGNED
30			"
31			NO UNITS

NOTE: Engineering Units display will read "EU" if a Units Code is selected that is not included in the display capability of the Logger.

TABLE C.4.1
AVAILABLE UNITS CODES

STANDARD RANGE CODES

CODE	OUTPUT	UNITS	COMMENTS
0			NOT IMPLEMENTED
1			"
2			"
3			"
4			"
5			"
6	±12.000	VOLT	X ½ ATTENUATOR
7			NOT IMPLEMENTED
8	±6.000	VOLT	DIRECT
9			NOT IMPLEMENTED
10	±1.5000	VOLT	DIRECT
11	±600.0	MV	"
12	±300.00	MV	"
13	±150.00	MV	"
14	±60.00	MV	"
15	±30.000	MV	"
16	±15.000	MV	"
17			NOT IMPLEMENTED
18			"
19			"
20	±752.0	DEGF	TYPE T TC
21	±1391.0	DEGF	TYPE J TC
22	±2500.0	DEGF	TYPE K TC
23			NOT IMPLEMENTED
24	0000	UE	STRAIN GAGE
25			"
26			"
27			"
28			"
29			"
30			"
31	open-closed		CONTACT

TABLE C.5.1
STANDARD RANGE CODES

C.5 Range (continued)

The value of this code for a particular channel may be examined by first accessing the channel by one of the methods described in C.1, and then depressing the RANGE key. When the RANGE key is depressed the MONITOR function is disabled and the DATA display and legend are replaced by the stored value of the RANGE code. Depressing the CLEAR key reactivates the MONITOR.

The RANGE code may be altered by executing the following key sequence:

INPUT/RANGE/(00-31)/LOAD → use 125 for channel 000
use 126 " " 001,002

When the INPUT key is depressed the MONITOR function is disabled and the DATA display and legend are blanked. When the LOAD key is depressed the MONITOR is reactivated.

C.6 High Limit

The value of the high limit for a particular channel may be examined by first accessing the channel by one of the methods described in C.1, and then depressing the HIGH key. When the HIGH key is depressed the MONITOR function is disabled and the DATA display is replaced by the stored value of the HIGH LIMIT. Depressing the CLEAR key reactivates the MONITOR.

The HIGH LIMIT may be altered by executing the following key sequence:

INPUT/HIGH/(5 digits)/LOAD

Negative values may be entered by the following key sequence:

INPUT/HIGH/MINUS/(5 digits)/LOAD

In either case the numeric entry may not exceed 32000.

When the INPUT key is depressed the MONITOR function is disabled and the DATA display is blanked. When the LOAD key is depressed the MONITOR is reactivated.

C.7 Low Limit

The value of the low limit for a particular channel may be examined by first accessing the channel by one of the methods described in C.1, and then depressing the LOW key. When the LOW key is depressed the MONITOR function is disabled and the DATA display is replaced by the stored value of the LOW limit. Depressing the CLEAR key reactivates the MONITOR.

C.7 Low Limit (continued)

The low limit may be altered by executing the following key sequence:

INPUT/LOW/(5 digits)/LOAD

Negative values may be entered by the following key sequence:

INPUT/LOW/MINUS/(5 digits)/LOAD

In either case the numeric entry may not exceed 32000.

When the INPUT key is depressed the MONITOR function is disabled and the DATA display is blanked. When the LOAD key is depressed the MONITOR is reactivated.

D. SPECIAL PROGRAMMING

D.1 Mode 06 [M for M(X) + B]

The scale of a linear signal can be changed by adjusting its slope and intercept, in effect providing a zero and span control for each channel. The M value corresponds to the digital span control. See the M(X) + B section (F.8) for a discussion.

The value of M assigned to the channel currently being displayed may be examined by selecting 06 with the MODE thumbwheel. Other channels may be accessed by one of the methods described in C.1. Mode 06 disables the MONITOR function and replaces the DATA display and legend with the stored value of M. The MONITOR may only be reactivated by returning to 00 with the MODE thumbwheel. While in MODE 06 the value of M may be altered by the following key sequence:

INPUT/DATA/(0-32.000)/LOAD

Negative values may be entered by the following key sequence:

INPUT/DATA/MINUS/(0-32.000)/LOAD

Note that M is a fixed decimal point number of the form:

XX.XXX

whose maximum value regardless of sign is 32.000.

D.2 Mode 07 [B for M(X) + B]

The scale of a linear signal can be changed by adjusting its slope and intercept, in effect providing a zero and span control for each channel. The B value corresponds to the digital offset control. See the M(X) + B section (F.8) for a discussion.

The value of B assigned to the channel currently being displayed may be

D.2 Mode 07 [B for M(X) + B] (continued)

examined by selecting 07 with the MODE thumbwheel. Other channels may be accessed by one of the methods described in C.1. Mode 07 disables the MONITOR function and replaces the DATA display with the stored value of B. The MONITOR may only be reactivated by returning to 00 with the MODE thumbwheel. While in MODE 07, the value of B may be altered by the following key sequence:

INPUT/DATA/(0-32000)/LOAD

Negative values may be entered by the following key sequence:

INPUT/DATA/MINUS/(0-32000)/LOAD

Note that the maximum value of B is 32000 regardless of sign or decimal point.

D.3 Mode 09 (Skipped Channel Display)

This mode is a diagnostic aid which allows the operator to quickly identify skipped channels. The procedure is as follows:

D.3.1 Set the FIRST and LAST thumbwheels to include the block of channels which is to be tested for the SKIP condition.

D.3.2 Set the MODE thumbwheel to 09.

D.3.3 Depress the MANUAL key.

This will disable the MONITOR function and blank the entire display. If a number appears in the CHANNEL display, then this is the first channel in numerical sequence between the FIRST and LAST channels which is assigned the SKIP condition. Each depression of the MANUAL key will advance the CHANNEL display to the next skipped channel. A blank CHANNEL display indicates that there are no more skipped channels in the particular FIRST/LAST block of channels.

D.4 Automatic Balance and Span for Strain Gages

This optional program package allows the microprocessor to automatically sense the zero condition of the Strain Gage bridge, compensate for it and scale the data directly to microinches/inch. There is no need for balance or span (gage factor) controls in the signal conditioning. Operation is as follows:

All strain gage channels are identified with the correct units code. The operate mode switch is placed in position "4" and a data run is taken. The values measured for the strain channels represent their zero condition

and that value is stored in RAM.

The operate mode switch is placed in position "5" and the strain gage signal conditioner's shunt CAL network is activated. A data scan is again taken. These values represent the calibration level of the channels and all are again stored in RAM.

Finally, a Sensitivity number (S) is entered for each of these channels. These are entered via the keyboard with the mode switch on position "3" by the sequence:

INPUT/DATA/S/LOAD

The Sensitivity number is the value in real engineering units which the shunt CAL represents. For example, "S" for a strain gage channel is the solution of:

$$S = \frac{1}{nk}\,\frac{R}{R + R\,cal}$$

where: n = # active arms
k = gage factor
R = gage resistance
Rcal = shunt cal resistance

The mode switch is then returned to "0" and records taken normally.

When a strain gage channel is encountered in the data scan, the output Data (D) recorded is properly scaled in the processor by solving the equation:

$$D = \frac{D' - Z}{C - Z}\,S$$

where: D' is the raw data measured
Z is the stored zero reading
C is the stored cal reading
S is the stored sensitivity factor

Choice of the correct units code will automatically activate this sequence and affix the appropriate units designation.

E. RUN MODES

E.1 Mode 00 (Normal)

Upon scan initiation (RUN), the unit scans from the FIRST channel to the LAST channel. The number of consecutive scans per initiation is selectable from 1 to 9 (SCANS).

Once started, the unit will reinitiate scans. The interval between scan initiations is selectable between 0 and 99 minutes (SCAN INTERVAL).

E.1 Mode 00 (Normal) (continued

For any scan interval less than the total elapsed scan or log time, channel scanning is continuous. During the scan, channel data is checked against limits. If limits are exceeded, the alarm indicator lights and will remain lit until the scan is stopped (RESET). In a like manner, a relay contact is energized for the appropriate condition (over high limit, in limits, under low limit) until the scan is stopped.

The unit is capable of output to one or more devices according to the setting of the OUTPUT switch.

While the unit is in the RUN mode, a channel may be selected whose data is displayed on the front panel at an update rate of once per second, by keying in the following sequence:

INPUT/CHAN/(000-999)/LOAD

E.2 Mode 12 (RAM Dump)

If the MODE thumbwheel is set to 12 and the RUN key is depressed, the machine will dump the entire contents of its user-accessible memory to the device selected by the OUTPUT thumbwheel setting, and return to RESET. The output is a hexadecimal ASCII format intended as part of the WRITE/STORE/READ feature. In normal use this mode is used to generate cassette or punched paper storage records.

E.3 Mode 13 (RAM Load)

If the MODE thumbwheel is set to 13 and the RUN key is depressed, the machine will load its user-accessible memory from a record read from the device selected by the OUTPUT thumbwheel setting, and return to RESET.

F. SPECIAL FEATURES & FUNCTIONS

F.1 Monitor

The normal display, when not otherwise engaged, is a channel number with the data for that channel updated once per second. Any channel in the system may be displayed by the normal channel access methods at any time.

F.2 Multi-Entry Key

The use of the MULT key changes the loading of channel parameters from single channel operations to channel block operations. If the MULT key is depressed immediately before the LOAD key is depressed, then the associated parameter is loaded not only into the channel in the CHANNEL display, but into all channels between the settings in the FIRST and LAST thumbwheels. The following are the allowed usages of MULT:

C.2 SKIP	INPUT/SKIP/(0-3)/MULT/LOAD
C.3 ALARM	INPUT/ALARM/(0-3)/MULT/LOAD
C.4 UNITS	INPUT/UNIT/(00-31)/MULT/LOAD
C.5 RANGE	INPUT/RNGE/(00-31)/MULT/LOAD
C.6 HIGH LIMIT	INPUT/HIGH/(0-32000)/MULT/LOAD
	INPUT/HIGH/MINUS/(0-32000)/MULT/LOAD
C.7 LOW LIMIT	INPUT/LOW/(0-32000)/MULT/LOAD
	INPUT/LOW/MINUS/(0-32000)/MULT/LOAD
D.1 M	INPUT/DATA/(0-32.000)/MULT/LOAD
	INPUT/DATA/MINUS/(0-32.000)/MULT/LOAD
D.2 B	INPUT/DATA/(0-32000)/MULT/LOAD
	INPUT/DATA/MINUS/(0-32000)/MULT/LOAD

F.3 Clear Entry Key

This key has two functions; one which is absolute and one which is conditional.

F.3.a Program Sequence Abort (Absolute)

All programming sequences begin by depressing the INPUT key and terminate by depressing the LOAD key. If a programming sequence has begun but not yet terminated it may be "erased" by depressing the CLR key. This will return the machine, including displays to the point just before the INPUT key was depressed.

F.3.b Display Abort (Conditional)

Some display conditions are the result of depressing one or another of the keys. Depressing the CLR key terminates these displays and restarts the MONITOR feature. The following displays may be so terminated:

F.3.b.1. TIME
2. DATE
3. SKIP
4. ALARM
5. UNITS
6. RANGE
7. HIGH LIMIT
8. LOW LIMIT

NOTE: The above keys are interactive in that they may be sequentially depressed without returning to the MONITOR by means of the CLR key. The operator may easily examine the parameter values associated with these keys by depressing the keys. The MONITOR may be reaccessed from any of the above displays by depressing the DATA key, which in this case has the same effect as the CLR key, since the above displays all "clear" to the MONITOR.

F.4 WRITE/STORE/READ

Some caution must be exercised when using this feature (Modes 12 and 13). A record generated by a "large" machine cannot be loaded successfully into a "small" machine. The configuration (Modes 99, 98, and 97) follows the same restrictions. Records generated by "small" machines may be loaded into the same or a "larger" machine.

F.5 Print

The data for the current channel may be printed on the selected output device, if it is not busy, by depressing the PRINT key.

F.6 Pause

While the unit is in RUN, the channel scan may be suspended by depressing the PAUSE pushbutton. Logging will continue up to the last scanned channel. Depressing the PAUSE pushbutton again will cause the scan and log to resume.

F.7 Paper

Ten (10) line feeds may be dispatched to the current output device, if it is not busy, by depressing the PAPER key.

F.8 M(X) + B (Option)

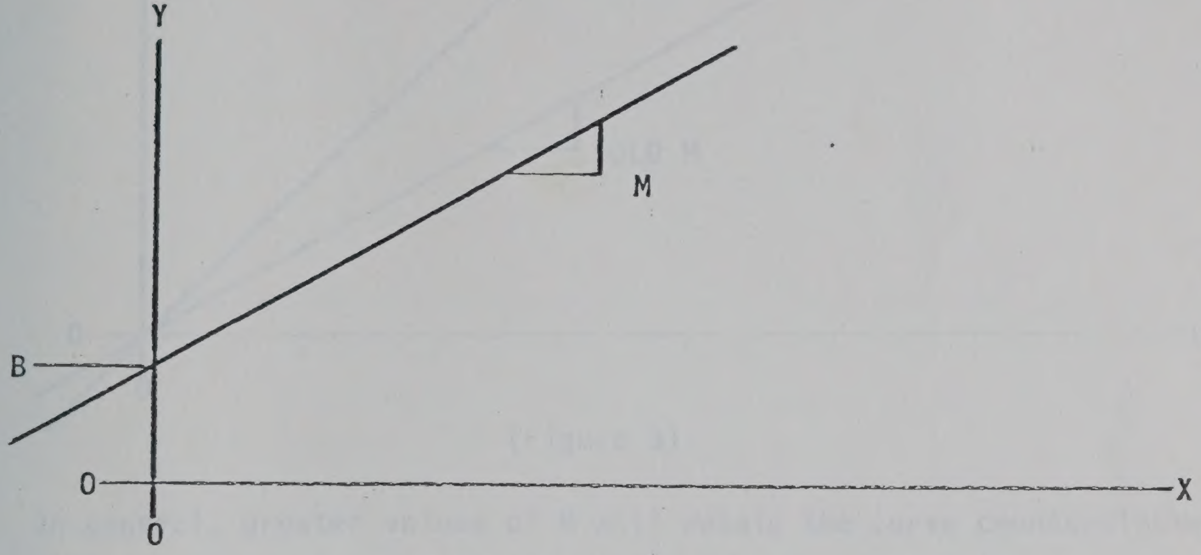
This feature provides the capability to digitally span and offset an input signal. This enables a single signal conditioner to be used for many similar input signals while providing scaling and offset on a

channel by channel basis. Use of this feature effectively replaces such techniques as transducer matching and channel by channel signal conditioning.

This feature operates on the principle that transducers of similar type have characteristically similar output equations (characteristic curves) which differ only in their overall gain and zero offset. If the output of such a transducer is treated as a straight line, its output equation is of the form:

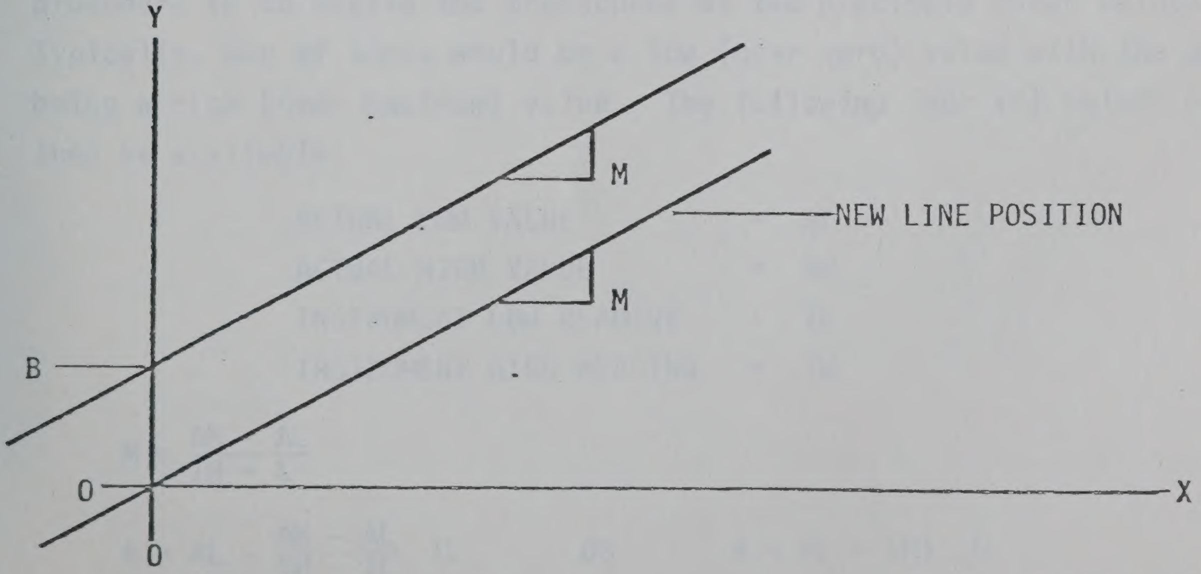
$$Y = MX+B$$

M being the slope of the line, and B the zero offset as in Figure 1.



(Figure 1)

By changing B one may move the curve along the Y axis until it passes through zero without affecting M as in Figure 2.

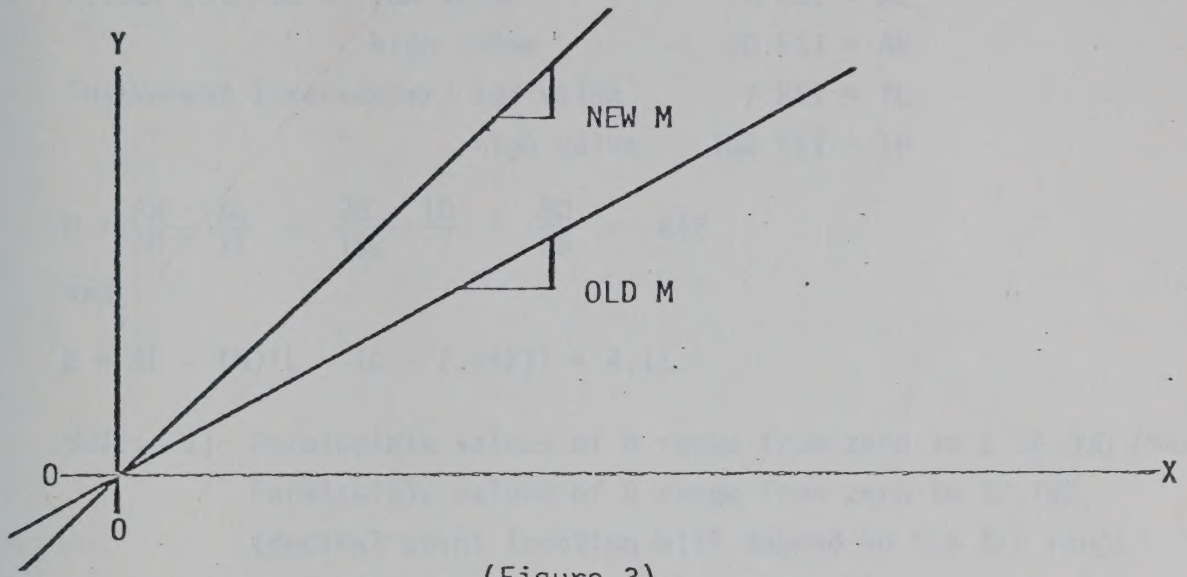


(Figure 2)

F.8. M(X) + B (continued

In general, positive values of B will move the curve up the Y axis and negative values of B will move the curve down the Y axis.

Once the curve has been moved vertically such that is passes through the origin (0,0), M can be changed as in Figure 3.



(Figure 3)

In general, greater values of M will rotate the curve counterclockwise while smaller values of M will rotate the curve clockwise.

It follows that any two curves can be made to match exactly if suitable values of M and B are chosen. In practive each curve is matched to a "standard" or ideal curve for the particular transducer type. The procedure is to excite the transducer at two precisely known values. Typically, one of these would be a low (near zero) value with the second being a high (near Maximum) value. The following four (4) values would then be available:

ACTUAL LOW VALUE = AL
ACTUAL HIGH VALUE = AH
INSTRUMENT LOW READING = IL
INSTRUMENT HIGH READING = IH

$$M = \frac{AH - AL}{IH - L}$$

$$B = AL - \frac{AH - AL}{IH - IL}\ IL \qquad \text{OR} \qquad B = AL - (M)\ IL$$

Example:

A pressure transducer tested against a standard gauge or other accepted "standard" is excited to produce an output equivalent to 10% and 90% of full scale:

Actual (standard) low value 10 PSI = AL
" " high value 90 PSI = AH
Instrument (transducer) low value 7 PSI = IL
" " high value 102 PSI = IH

$$M = \frac{AH - AL}{IH - IL} = \frac{90 - 10}{102 - 7} = \frac{80}{95} = .842$$

and,

$$B = AL - (M)IL = 10 - (.842)7 = 4.11$$

NOTE: 1) Permissible values of M range from zero to ± 32.000 (Max.) Permissible values of B range from zero to 32.768 (decimal point location will depend on the A/D range selected for the particular channel)

2). For zero and span adjustment for inputs such as 1-5V, 4-20ma, 10-50ma, etc., which may require values of M and B beyond the limits listed above, utilize the appropriate A/D range and an appropriate external resistor across the transducer input leads to reduce the values of M & B within permissible limits.

The actual values must be provided by some other device, preferably of great accuracy since M and B are being calculated to adjust the instrument readings to conform with these values.

Once M and B have been determined by calculation, they may be entered in the program by the method previously described (Modes 6 and 7).

If the calculated M value is greater than 32.000, then decimal point readjustment is required.

As defined earlier in the manual, our system has an input and output data limit of ±32000. The M in this system has a three (3) decimal point accuracy, therefore the M value inputted has a limit of ±32.000

$$-32.000 \leq M \leq 32.000$$

F.8 M(X) + C (continued)

For example; for a channel with range 16 (15 mV range) and

AL = 1 (lbs)
AH = 1500 (lbs)
IL = 0.002 (mV)
IH = 9.000 (mV)

$$M = \frac{AH - AL}{IH - IL} = \frac{1499}{8.998} = 166.593$$

$$B = AL - M \times IL = 1 - 166.593 \times 0.002 = 0.667$$

Since M is greater than 32.000, the decimal point position has to be adjusted in order to produce a data size within the displaying limit. In this situation, it is obvious that the accuracy of the data has to be decreased to at most one (1) decimal place (See Appendix II).

If we enter M = 1.666
B = 0.007

and if the input signal is 9 mV, then the data display for that channel will be 15.001.

However, the operator should realize that the decimal point on display is not in the right place since we change the decimal point position of M and B value. The data display should be interpreted as 1500.1 (lbs) as reflected by the M and B decimal point change.

APPENDIX I

The following is a summary of No. of counts/unit for different voltage ranges:

RANGE CODE	VOLTAGE RANGE	NO. OF COUNTS/UNIT	ASCII UNIT
0	± 6V	30,000/6V	NO UNIT
1	± 1.5V	30,000/1.5V	NO UNIT
2	± 600mV	30,000/600mV	NO UNIT
3	± 300mV	30,000/300mV	NO UNIT
4	± 150mV	30,000/150mV	NO UNIT
5	± 60mV	30,000/60mV	NO UNIT
6	± 12.000V	1000/VOLT	VOLT
7	NOT IMPLEMENTED		
8	± 6.000V	1000/VOLT	VOLT
9	NOT IMPLEMENTED		
10	± 1.5000V	10,000/VOLT	VOLT
11	± 600.0mV	10/mV	mV
12	± 300.00mV	100/mV	mV
13	± 150.00mV	100/mV	mV
14	± 60.00mV	100/mV	mV
15	± 30.000mV	1000/mV	mV
16	± 15.000mV	1000/mV	mV
17	± 30mV	30,000/30mV	NO UNIT
18	± 15mV	30,000/15mV	NO UNIT

APPENDIX II

From Appendix I, for range 16 (15mV range) every 1000 counts represent 1mV.

In order to find out how the decimal point of M value should be shifted, we have to keep in mind that the total data on display cannot exceed 32000 counts.

For example, if we enter:

M = 16.659

B = 0.067

A 9mV input will correspond to:

9000 x 16.659 + 67 = 149998 counts

that is definitely over the data display limit. Therefore, it is obvious that M has to less than 16.659.

Example: M = 1.666

B = 0.007

Now, a 9mV input will correspond to:

9000 x 1.666 + 7 = 15001

and the data is within display range. Since we change the decimal point position of M and B, (the original M and B/100), the data on display should be interpreted as data/100.

F.9 Lock

This unit is provided with a LOCK/ENABLE keylock switch. In the LOCK position the only allowable access to the system is the MONITOR feature. Any channel in the system may be monitored by accessing the channel as follows:

INPUT/CHAN/(000-999)/LOAD

The CLR key also functions in the LOCK position.

NOTE: If the machine is powered up in the LOCK position, Modes 99, 98, and 97 are bypassed. The machine assumes the presence of battery protected memory, and powers up in RESET with the MONITOR enabled.

F.10 Error Messages

As an aid to programming and operation of this system, a number of error messages have been prepared to alert the operator, either by means of the front panel, or the selected OUTPUT device, when an unallowed sequence of operation is attempted.

F.10.a If an attempt is made to enter an illegal channel number in modes 99, 98, or 97, an error message of

⊏ 99, ⊏ 98 or ⊏ 97

will appear in the CHANNEL display. The recovery procedure is to set the FIRST and LAST thumbwheels to the correct numbers, depress the CLEAR key and continue.

F.10.b It is possible to select an illegal channel, which will appear in the CHANNEL display. However, the MONITOR will not process the channel, and will blank the DATA display and legend. If the operator attempts a program key such as HIGH or LOW, the DATA display will show the error message:

⊏⊏⊏ X X X

where XXX is the illegal channel. The recovery procedure is to depress the CLEAR key and then alter the channel number by one of the legal methods to a legal channel number.

F.11 Mode 90 (Calibration Numbers)

This machine is equipped with a self-calibrating A/D converter. At the factory the P/ROM memories are "trimmed" digitally to match the internal NBS traceable standard on the A/D to our factory NBS traceable standard. Should it become necessary to replace the A/D converter, the "trim" numbers in the P/ROM memories would in general no longer be correct. In order for system accuracy to be maintained, the calibration numbers supplied with the particular A/D converter must be entered in the following manner:

Set the MODE thumbwheel to 90. Execute the key sequence:

```
           INPUT/1/DATA/(5 digit number)/LOAD
           INPUT/2/DATA/(5 digit number)/LOAD
           INPUT/3/DATA/(5 digit number)/LOAD
               ↓
               ↓
               ↓
               ↓
               ↓
               ↓
               ↓
           INPUT/18/DATA/(5 digit number)/LOAD
```

The five digit numbers are the calibration numbers.

F.12 Readings Thumbwheel

The Readings thumbwheel located on the front panel is not active in your particular logger. This thumbwheel is reserved for future use. Setting of this thumbwheel at this time will have no effect on any of the operations of your logger.

F.13. Data Averaging

Data average code is entered through range code input. When INPUT 1 RANGE keys were entered the front panel display will have a 3 digits display. If that channel (or channels) is intended for data averaging, the operator should enter:

```
                    1 XX
                    |  ↓
                    |  range code
                    ↓
     Data average code
```

If not, just enter range code

```
                    0 XX
                    ↓  └range code
     No data average
```

Same is true for multi-entry.

In this particular system, only 10 channel's average data are reserved in RAM.

F.14. Special Data Averaging Display - Mode 14

When the mode thumbwheel is switched to 14, Monitor will display current channel's average data only if the Data average code is set, otherwise the display will be blank.

F.15. Special range 25 - 4-20ma square root signal - flow rate

The 4-20ma will correspond to flow rate range from 0 to 700.0 KGPM (kilo gallon per minute).

The operator will have to enter M and B through Mode 6 and 7 to correct the data output reading.

The range 25 is in gain 0, 6v range. The B value entered is for correction of the initial reading to read 0. The M value is a multiplier to adjust the data magnitude.

The following are examples of M and B values. The calculations based on a '250 r' resistor is connected across the inputs.

INITIAL CURRENT	INITIAL VOLTAGE	'B' FACTOR	'M' FACTOR
4 ma	1 v	-500.0	4.950
3 ma	0.75 v	-375.0	4.802
2 ma	0.5 v	-250.0	4.667
1 ma	0.25 v	-125.0	4.542

F.16. Special range 26 - 4-20ma linearized input

Temperature range 0 to 200°F.

The operator will have to enter M and B through mode 6 and 7.

This range 26 is in gain 0, 6v range. The following calculations based on a '250 r' resistor is connected across the inputs.

INITIAL CURRENT	INITIAL VOLTAGE	'B' FACTOR	'M' FACTOR
4 ma	1v	-50.00	1.000
3 ma	0.75v	-37.50	0.941
2 ma	0.5 v	-25.00	0.889
1 ma	0.25v	-12.50	0.842

F.17. Average Data hourly print-out

The system will automatically print-out the hourly average data of the system.

F.18. Accumulate flow for range 25

System will automatically print-out the hourly total accumulated flow.

F.19. The system will print-out at 0 hour (00 = 00) the high and low reading of the day for range 26 channels in the system.

VI. MAINTENANCE

A. Integral Printer & Printer Electronics (Option)

Loosen thumbscrews on printer panel and pull printer out of the Logger. Now the panel may be opened to gain access to the printer interface logic board located in the far left slot between the printer and the unit case. See Figure 1.

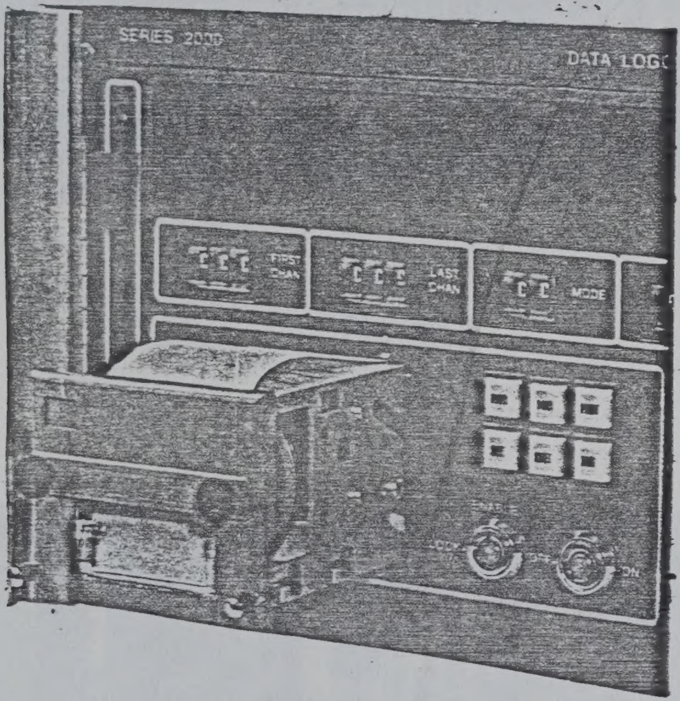


Figure 1

Before attempting to remove the printer card, first loosen the two (2) Phillips head screws on the outside of the Logger case holding the panel latch bracket. The latch screws are located in slots allowing the latch bracket to move upward when the holding screws are loose. Slide the bracket up out of the path of the printer card so that the card can be removed for service. See Figures 2 and 3.

CAUTION: DO NOT ADJUST THE DIGITAL SWITCHES LOCATED ON THIS CARD BEFORE CONSULTING FACTORY.

A. Integral Printer & Printer Electronics (Option) CONTINUED....

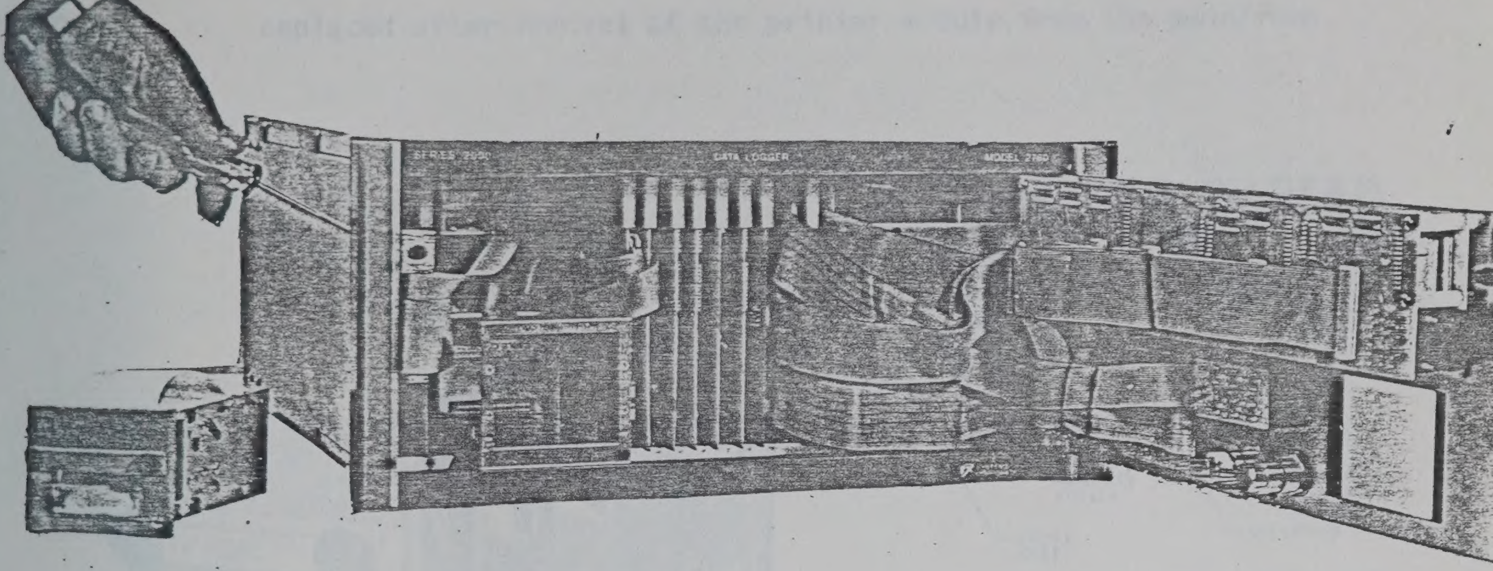

SERIES 2000
DATA LOGGER
MODEL 2160

Figure 2

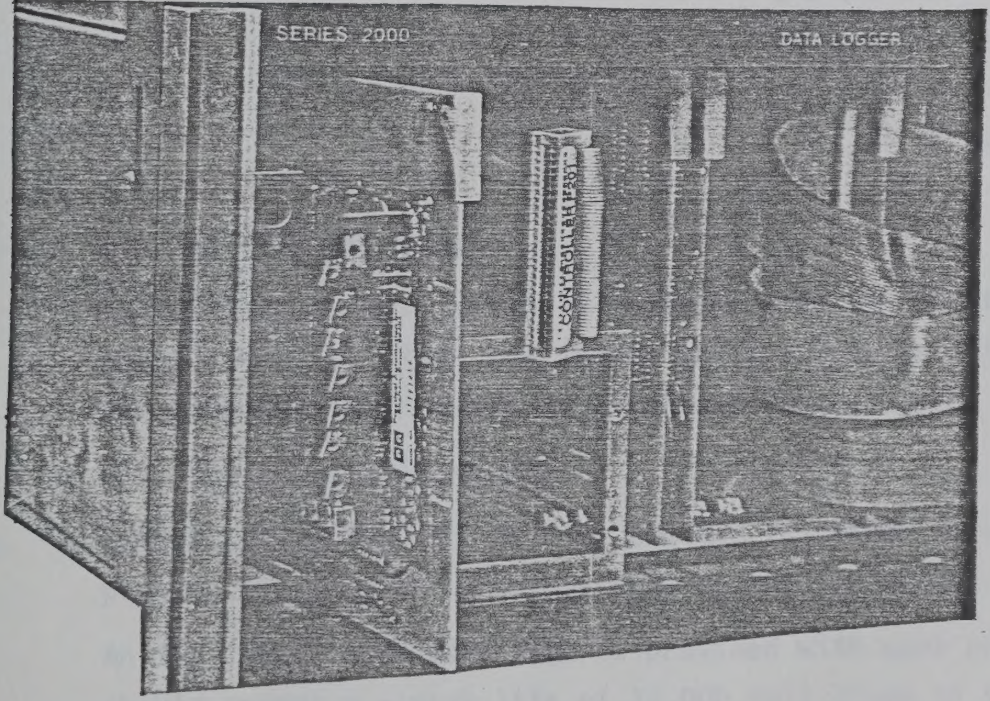

SERIES 2000
DATA LOGGER
CONTROLLER

Figure 3

A.1 Paper Roll Replacement

Figure 4 and Figure 5 pictorially show how the paper roll is replaced after removal of the printer module from the mainframe.

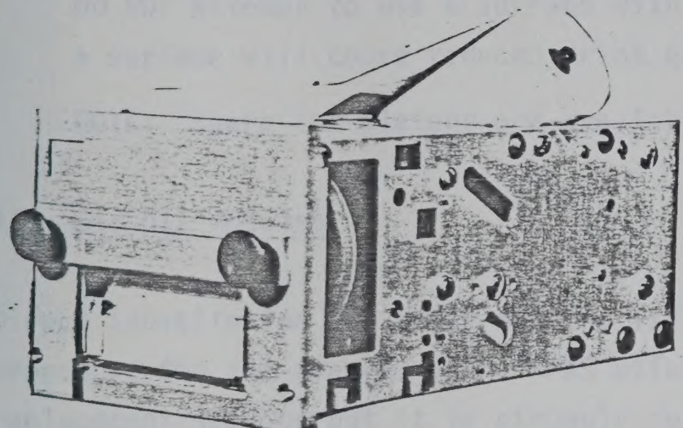
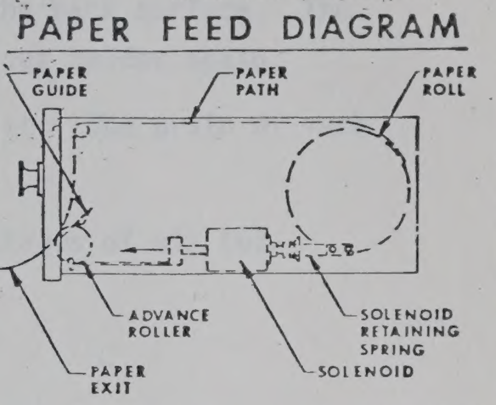


Figure 4



1. Depress Solenoid plunger until retaining spring locks solenoid in foward position.
2. Seat paper roll in socket.
3. Tear paper square, insert per diagram.
4. Pushing paper to edge of advance roller, turn advance roller until paper is engaged.

IMPORTANT

Release solenoid retaining spring prior to operation. For two-copy printing (Model 101), insert second roll and thread two paper layers following above procedure.

Figure 5

A.2 Replacement Paper

The preferred paper, which is supplied with the printer is 12 lb. white bank bond about .004 inches thick. However, other papers not exceeding .007 inches in thickness may be used.

A.3 Ink Platen Replacement

Remove the small panel held by the two (2) black screws on the printer front panel to gain access to the ink platen.

An ink impregnated cartridge is provided with each printer and should render a useful life of 75,000 full lines of print if utilized properly. The cartridge is symmetrical and provides two (2) usable sides with four (4) usable printing surfaces.

A.3 Ink Platen Replacement (continued)

Exhaustion of a surface after about 19,000 lines is indicated by embossing or tearing of the paper by the needles or light printing.

To use the second surface, turn the ink cartridge holder end for end (without removing the ink block) and reinstall. The third surface is used by removing the ink block and using the back surface. The fourth surface is used by rotating the cartridge holder again.

DO NOT attempt to use a surface with an X on it. The grain of such a surface will cause reduced print quality.

NOTE: Spare ink platens are available in packages of six (6).

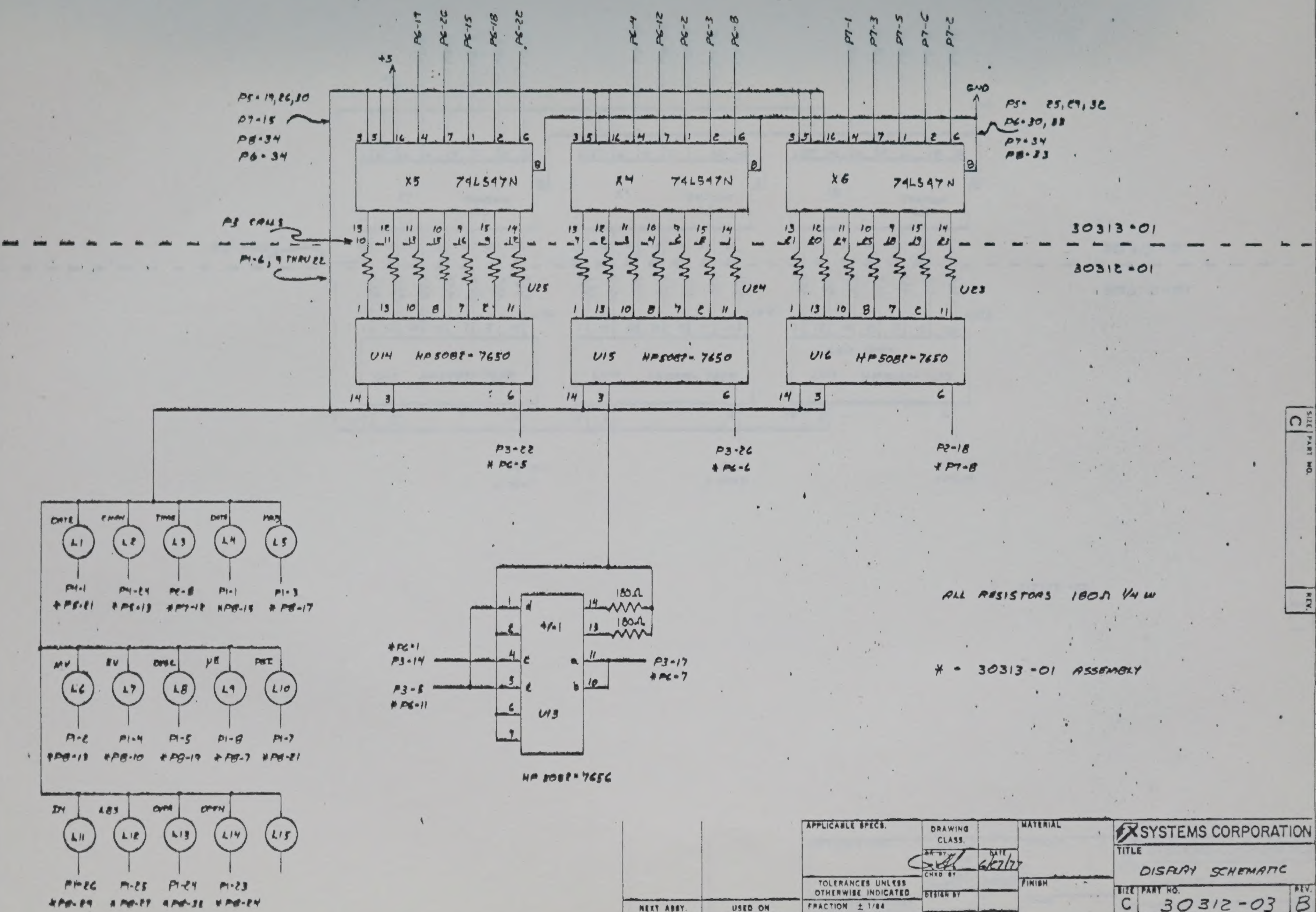
B. Circuit Modules

Direct substitution for these modules is the recommended field service procedure for the average user. FXS offers an expedited repair and/or replacement service but it is strongly recommended that spare modules be purchased for maintenance purposes.

It is impractical to include in this manual, all circuit descriptions of each of the standard and optional circuit modules available for your unit at a time of delivery without compromising the quality of this information. If a data sheet for each circuit module in your system as received from the factory has not been included wtih your manual, this information is available from the Sales Department, FX Systems Corporation, C.P.O. Box 1818, Kingston, NY 12401 (914) 338-0515.

VII. MODULE DATA SHEETS, PARTS LISTS AND SCHEMATICS

(See the following pages)


+5
GND
P6-17
P6-26
P6-15
P6-18
P6-22
P6-4
P6-12
P6-2
P6-3
P6-8
P7-1
P7-3
P7-5
P7-6
P7-2
P5-19,26,30
P7-15
P8-34
P6-34
P5- 25,29,32
P6-30,33
P7-34
P8-33
X5 74LS47N
X4 74LS47N
X6 74LS47N
P3 CALLS
P1-6, 9 THRU 22
30313-01
30312-01
U25
U24
U23
U14 HP5082-7650
U15 HP5082-7650
U16 HP5082-7650
P3-22
* P6-5
P3-26
* P6-6
P2-18
* P7-8
DATE
CHAN
TIME
DATE
MAN
L1
L2
L3
L4
L5
P1-1
* P8-21
P1-24
* P8-13
P6-8
* P7-12
P1-1
* P8-13
P1-3
* P8-17
MV
EV
DBSC
µB
PKT
L6
L7
L8
L9
L10
P1-2
* P8-13
P1-4
* P8-10
P1-5
* P8-19
P1-8
* P8-7
P1-7
* P8-21
IN
ABS
CMR
OPEN
L11
L12
L13
L14
L15
P1-26
* P8-29
P1-25
* P8-27
P1-24
* P8-32
P1-23
* P8-24
180Ω
180Ω
4/1
U13
HP 5082-7656
* P6-1
P3-14
P3-5
* P6-11
P3-17
* P6-7

ALL RESISTORS 180Ω 1/4 W

* - 30313-01 ASSEMBLY

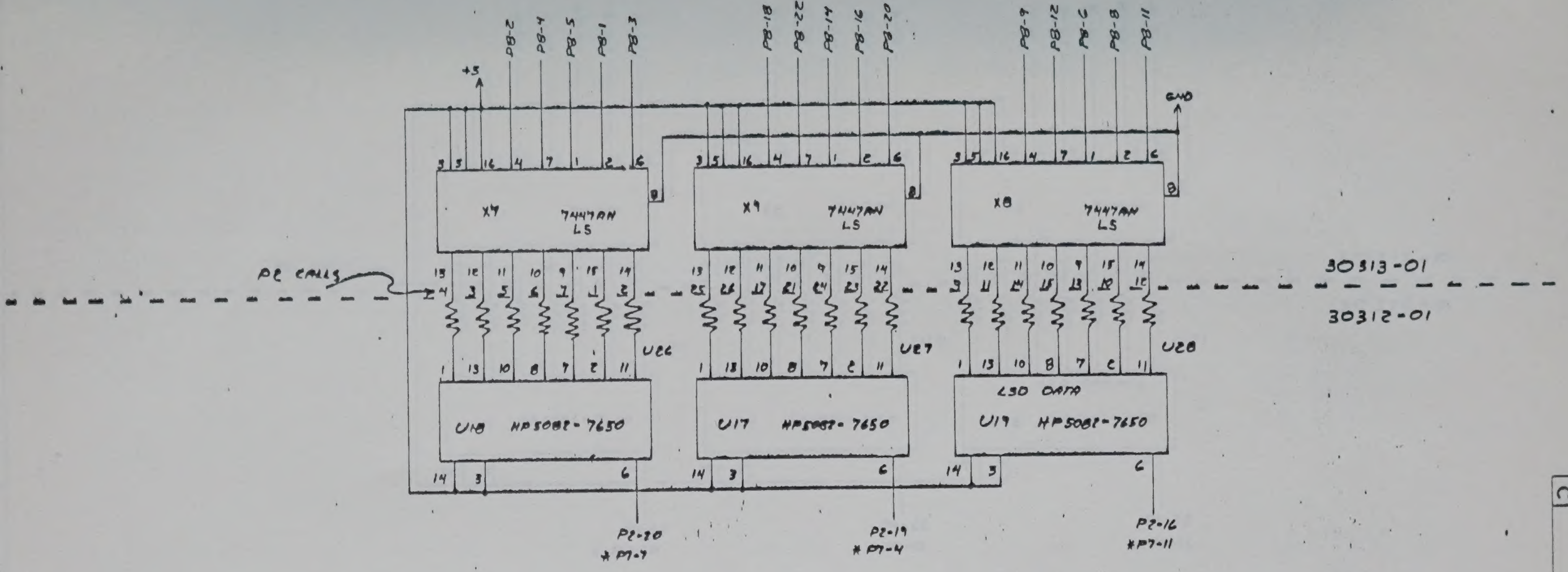
NEXT ASSY.	USED ON		
APPLICATION			
APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
TOLERANCES UNLESS OTHERWISE INDICATED FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DR BY	DATE 6/27/77	FINISH
	CHKD BY		
	DESIGN BY		
	APPRVD BY		

EX SYSTEMS CORPORATION

TITLE DISPLAY SCHEMATIC

SIZE	PART NO.	REV.
C	30312-03	B
SCALE	SHEET 1 OF 3	

SIZE	PART NO.	REV.
C		

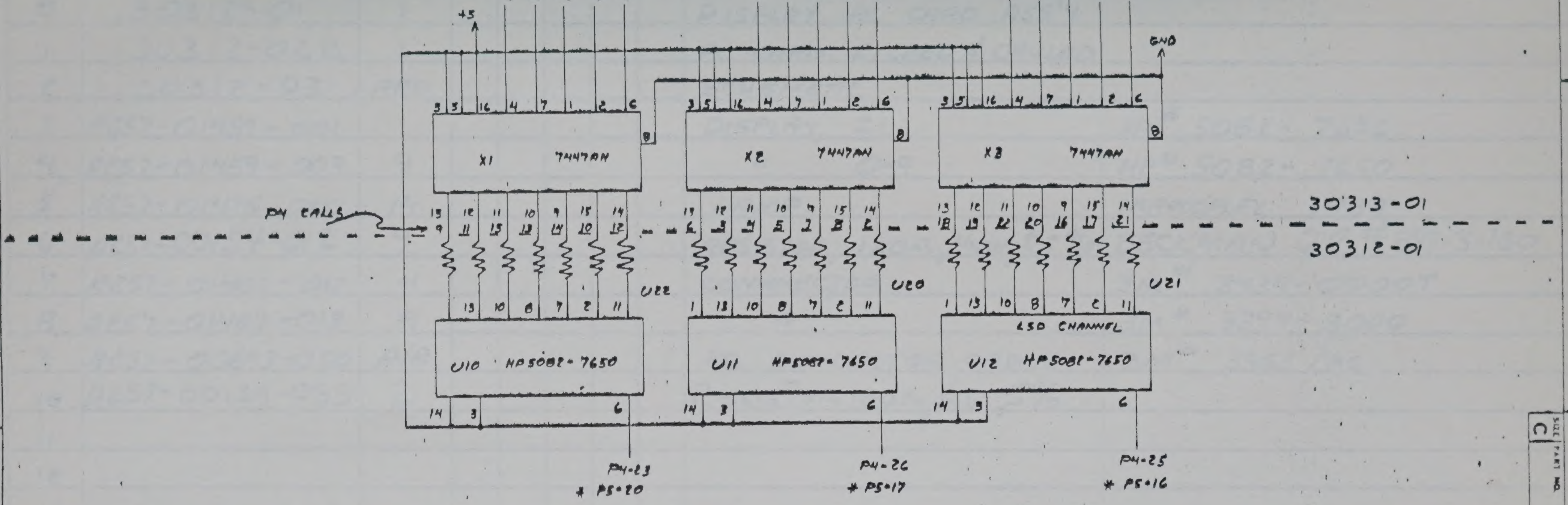

P8-2
P8-4
P8-5
P8-1
P8-3
P8-18
P8-22
P8-14
P8-16
P8-20
P8-9
P8-12
P8-6
P8-8
P8-11
+5
GND
X7
X9
X8
7447AN LS
7447AN LS
7447AN LS
PC CALLS
U26
U27
U28
LSD DATA
U18 HP5082-7650
U17 HP5082-7650
U19 HP5082-7650
P2-20
* P7-7
P2-19
* P7-4
P2-16
* P7-11
30313-01
30312-01

* 30313 -01

APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
	DR BY	DATE 6/27/77	
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DESIGN BY		
	APPRVD BY		

NEXT ASSY.	USED ON
APPLICATION	

SYSTEMS CORPORATION
TITLE
DISPLAY SCHEMATIC
SIZE C
PART NO. 30 312-03
REV. B
SCALE
SHEET 2 OF 3


+5
PS-11
PS-7
PS-14
PS-9
PS-5
PS-3
PS-8
PS-1
PS-2
PS-4
PS-12
PS-6
PS-15
PS-18
PS-10
GND
X1 7447AN
X2 7447AN
X3 7447AN
PY CALLS
30313-01
30312-01
U22
U20
U21
LSD CHANNEL
U10 HP5082-7650
U11 HP5082-7650
U12 HP5082-7650
P4-23
* PS-20
P4-26
* PS-17
P4-25
* PS-16

* 30313-01

APPLICABLE SPECS.	DRAWING CLASS.
TOLERANCES UNLESS OTHERWISE INDICATED	DA BY	DATE 6/2/77
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	CHKD BY DESIGN BY APPRVD BY

NEXT ASSY | USED ON
APPLICATION

MATERIAL

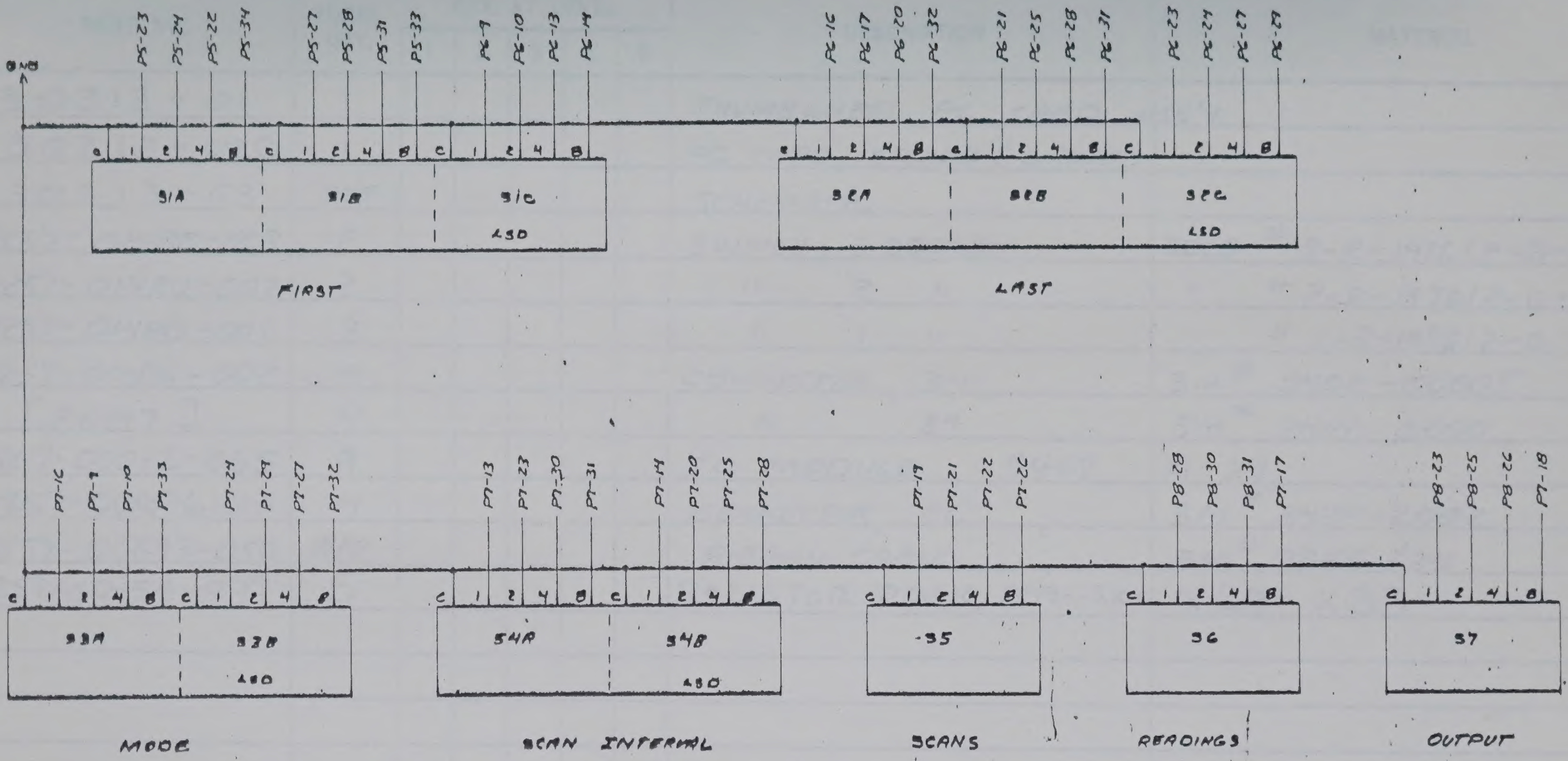
FINISH

SYSTEMS CORPORATION
TITLE DISPLAY SCHEMATIC
SIZE C PART NO. 30312-03 REV. B
SCALE SHEET 3 OF 3

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL					DESCRIPTION	MATERIAL
			1	2	3	4	5		
0	30312-01	1						DISPLAY PC CARD ASS'Y	
1	30312-02B	1						PC CARD, ETCHED & DRILLED	
2	30312-03	REF						SCHEMATIC	
3	A257-01459-001	1						DISPLAY, ±1	HP # 5082-7656
4	A257-01459-003	9						" 0-9	HP # 5082-7650
5	A257-01475-000	14						LAMP	MARCOFLEX 1739
6	A257-00154-012	9						RESISTOR, 180Ω, 1/4W, ±5%	BECKMAN DIP # 899-3-180
7	A257-01407-012	4						CONNNECTOR	3M # 3434-0000T
8	A257-01407-013	4						"	3M # 3399-3000
9	A257-00693-050	A/R						26 CONDUCTOR CABLE	3M # 3365/26
10	A257-00134-055	2						Resistor 180Ω, 1/4W, 5%	
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 7/13/77	DWG. NO. 30312-01 — REV. B
		CHKD. BY		
		APPRVD. BY		SHEET 1 OF 1

BRUNING 40-21 23352


GND
PS-23
PS-24
PS-22
PS-34
PS-27
PS-28
PS-31
PS-33
P6-7
P6-10
P6-13
P6-14
C 1 2 4 8
S1A
S1B
S1C
LSD
FIRST
P6-16
P6-17
P6-20
P6-32
P6-21
P6-25
P6-28
P6-31
P6-23
P6-24
P6-27
P6-29
S2A
S2B
S2C
LSD
LAST
P7-16
P7-9
P7-10
P7-33
P7-24
P7-29
P7-27
P7-32
S3A
S3B
LSD
MODE
P7-13
P7-23
P7-30
P7-31
P7-14
P7-20
P7-25
P7-28
S4A
S4B
LSD
SCAN INTERVAL
P7-19
P7-21
P7-22
P7-26
S5
SCANS
P8-28
P8-30
P8-31
P7-17
S6
READINGS
P8-23
P8-25
P8-26
P7-18
S7
OUTPUT

SIZE	PART NO.	REV.
C		

		APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
			DR. BY	DATE 6/27/77	
		TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH
NEXT ASSY.	USED ON	FRACTION ± 1/64	DESIGN BY		
APPLICATION		DECIMAL ± .005 ANGLE ± 1/2°	APPRVD BY		

SYSTEMS CORPORATION

TITLE
THUMBWHEEL SCHEMATIC

SIZE	PART NO.	REV.
C	.30313-03	B

SCALE
SHEET 1 OF 1

BILL OF MATERIAL

30313-01 C

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30313-01	1						THUMBWHEEL PC CARD ASS'Y	
1	30313-02C	1						PC CARD, ETCHED & DRILLED	
2	30313-03	REF						SCHEMATIC	
3	A257-01480-003	2						SWITCH, 3 SECTION	EECO # 3-R-197612-G-N-Y
4	A257-01480-002	2						" 2 "	" # 2-R-197612-G-N-Y
5	A257-01480-001	3						" 1 "	" # 1-R-197612-G-N-Y
6	A257-00476-002	4						CONNECTOR, 34	3M # 3402-0000T
7	[20197]	4						" , 34	3M # 3414-3000
8	A257-00012-065	9						IC MODULE 7447	X1-X9
9	257-00696-014	4						CONNECTOR, 26	3M # 3429-2002
10	A257-00693-050	A/R						RIBBON CABLE	3M # 3365/34
11	A257-00154-009	5						RESISTOR PACK 899-1-R10K	X29-X33

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 7/13/77

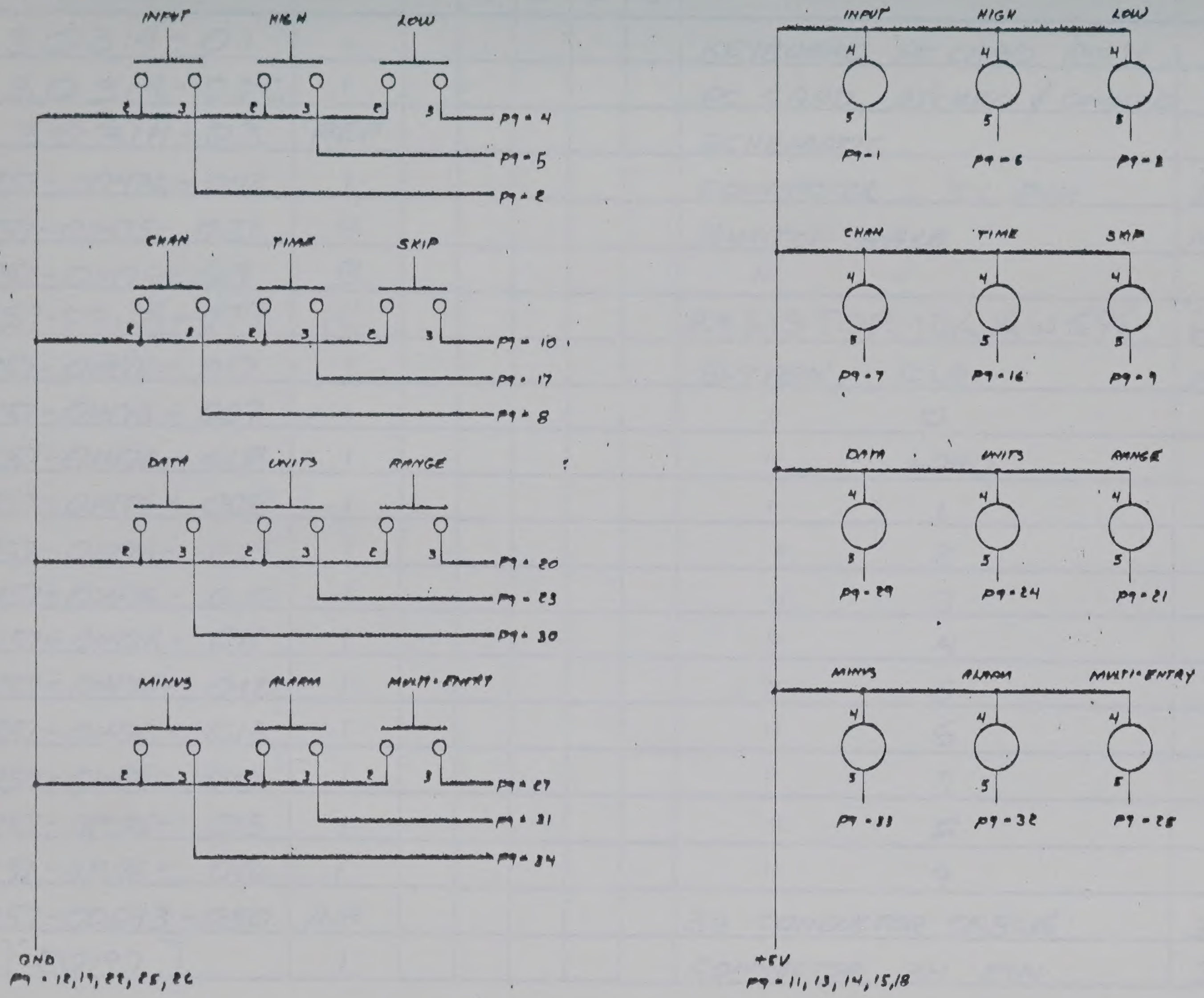
CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30313-01

REV. C


INPUT
HIGH
LOW
2
3
P9 - 4
P9 - 5
P9 - 2
CHAN
TIME
SKIP
P9 - 10
P9 - 17
P9 - 8
DATA
UNITS
RANGE
P9 - 20
P9 - 23
P9 - 30
MINUS
ALARM
MULTI-ENTRY
P9 - 27
P9 - 31
P9 - 34
GND
P9 - 12, 19, 22, 25, 26
4
5
P9 - 1
P9 - 6
P9 - 3
P9 - 7
P9 - 16
P9 - 9
P9 - 29
P9 - 24
P9 - 21
P9 - 33
P9 - 32
P9 - 28
+5V
P9 - 11, 13, 14, 15, 18

"A" SUBSCRIPT

NEXT ASSY.	USED ON
APPLICATION	

APPLICABLE SPECS.

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°

DRAWING CLASS.
DRAWN BY
DATE 6/24/77
CHKD BY
DESIGN BY
APPRVD. BY
MATERIAL
FINISH

SYSTEMS CORPORATION
TITLE SCHEMATIC, KEYBOARD
SIZE C
PART NO. 30314-03
REV. A
SCALE
SHEET 1 OF 1

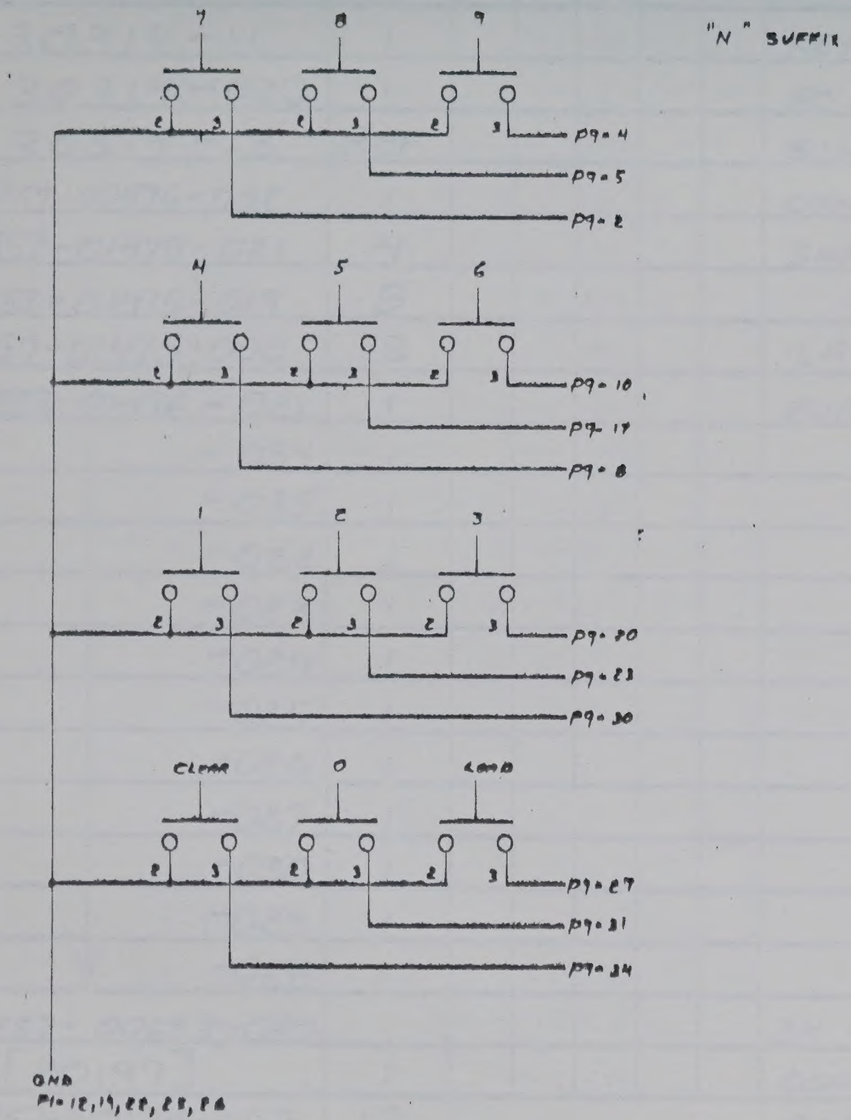
SIZE C PART NO. REV.

BILL OF MATERIAL

30314-01

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30314-01	1						KEYBOARD PC CARD ASS'Y	
1	30314-02C	1						PC CARD, ETCHED & DRILLED	
2	30314-03	REF						SCHEMATIC	
3	A257-00476-002	1						CONNECTOR, 34 PIN	3M # 3402-0000T
4	A257-01475-021	4						SWITCH BASE	MARCOFLEX 6622
5	A257-01475-019	8						" "	" 6620
6	A257-00134-097	12						RESISTOR 10K 1/4W 5%	R1-R12
7	A257-01476-017	1						BUTTON, CLR	MARCOFLEX
8	A257-01476-007	1						" 0	
9	A257-01476-018	1						" LOAD	
10	A257-01476-008	1						" 1	
11	A257-01476-009	1						" 2	
12	A257-01476-010	1						" 3	
13	A257-01476-011	1						" 4	
14	A257-01476-012	1						" 5	
15	A257-01476-013	1						" 6	
16	A257-01476-014	1						" 7	
17	A257-01476-015	1						" 8	
18	A257-01476-016	1						" 9	
19	A257-00693-050	A/R						34 CONDUCTOR CABLE	3M # 3365/34
20	[20197]	1						CONNECTOR, 34 PIN	3M # 3414-3000

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 7/1/77	DWG. NO. 30314-01
		CHKD. BY		REV.
		APPRVD. BY		SHEET 1 OF 1


7
8
9
4
5
6
1
2
3
CLEAR
0
LOAD
2
3
P9-4
P9-5
P9-2
P9-10
P9-17
P9-8
P9-20
P9-23
P9-30
P9-27
P9-31
P9-34
GND
P1-12,19,22,25,26

"N" SUFFIX

SIZE C
PART NO.
REV.

NEXT ASSY	USED ON	APPLICABLE SPECS.	DRAWING CLASS.
APPLICATION		TOLERANCES UNLESS OTHERWISE INDICATED FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DR BY CHKD BY DESIGN BY APPRVD BY

DATE 6/29/77

MATERIAL

FINISH

SYSTEMS CORPORATION

TITLE. SCHEMATIC,
KEYBOARD

SIZE C
PART NO. 30314-13
REV. A

SCALE .
SHEET 1 OF 1

BILL OF MATERIAL

30314-11 C

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30314-11	1						KEYBOARD PC CARD ASS'Y	
1	30314-02C	1						PC CARD, ETCHED & DRILLED	
2	30314-13	REF						SCHEMATIC	
3	A257-00476-002	1						CONNECTOR, 34 PIN	3M # 3402-0000T
4	A257-01475-021	4						SWITCH BASE	MARCOFLEX 6622
5	A257-01475-019	8						" "	" 6620
6	A257-01475-000	12						LAMP	" V739
7	A257-01476-021	1						BUTTON, INPUT	MARCOFLEX
8	-034	1						" HIGH	
9	-035	1						" LOW	
10	-022	1						" CHAN	
11	-023	1						" TIME	
12	-024	1						" SKIP	
13	-025	1						" DATA	
14	-026	1						" UNITS	
15	-027	1						" RNGE	
16	-030	1						" MINUS	
17	-029	1						" ALRM	
18	-028	1						" MULTI	
19	A257-00693-050							34 CONDUCTOR CABLE	3M # 3365/34
20	[20197]	1						CONNECTOR, 34 PIN	3M # 3414-3000
21	A257-00134-097	12						RESISTOR 10KΩ 1/4W 5%	R1-R12

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 7/1/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

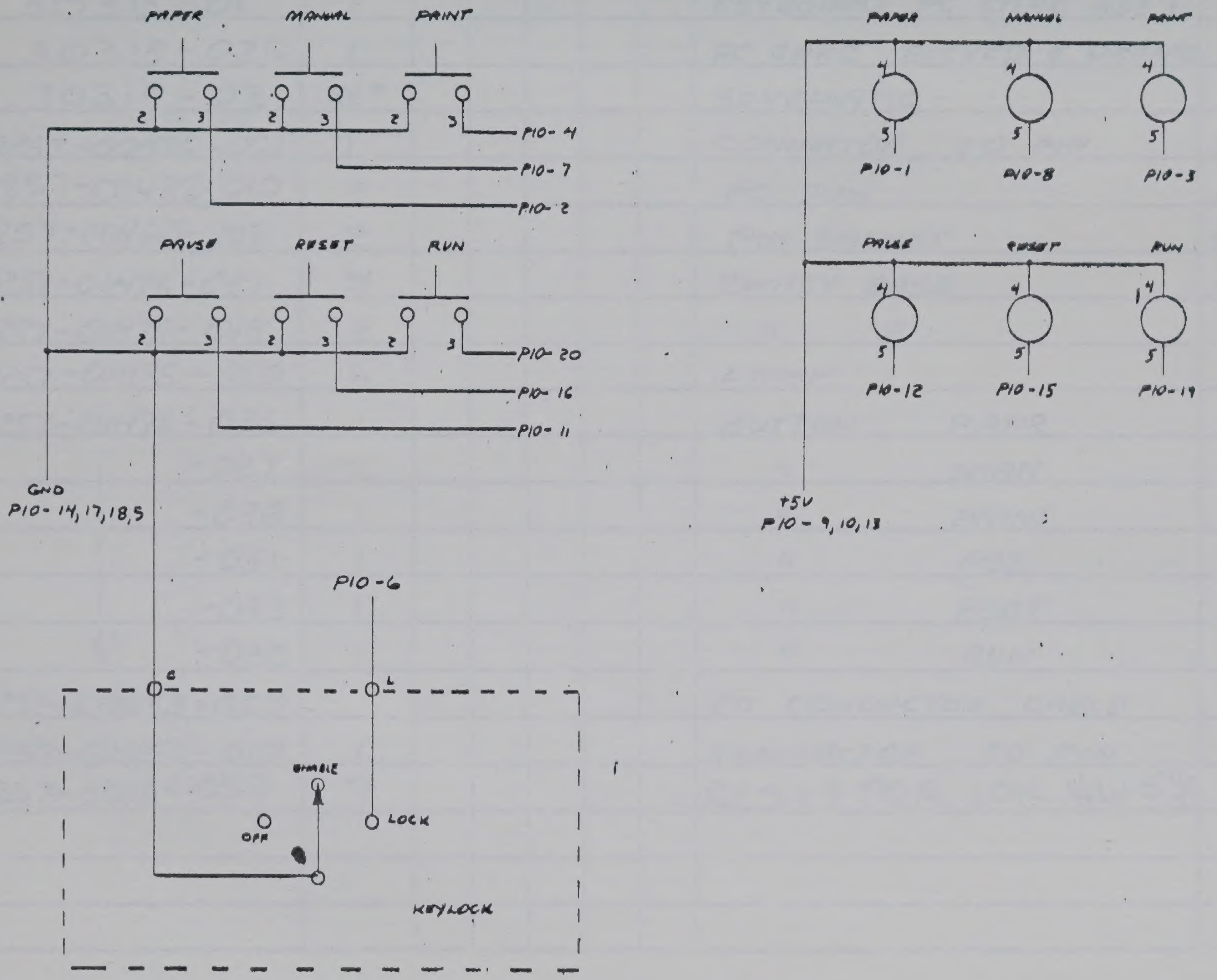
DWG. NO. 30314-11

REV. C

SHEET 1 OF 1

40-21 23352

ZONE	REV.	E.C.O.	DESCRIPTION	DRFT.	DATE	APPVD


PAPER
MANUAL
PRINT
2
3
P10-4
P10-7
P10-2
PAUSE
RESET
RUN
P10-20
P10-16
P10-11
GND
P10-14,17,18,5
P10-6
C
L
ENABLE
OFF
LOCK
KEYLOCK
4
5
P10-1
P10-8
P10-3
P10-12
P10-15
P10-19
+5V
P10-9,10,13

APPLICABLE SPECS.	DRAWING CLASS		MATERIAL	SYSTEMS CORPORATION
	DR BY	DATE 6/24/77		TITLE SCHEMATIC, KEYBOARD
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH	
FRACTION ± 1/64	DESIGN BY			SIZE C PART NO. 30315-08 REV. A

NEXT ASSY
USED ON

BILL OF MATERIAL

30315-01 C

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30315-01	1						KEYBOARD PC CARD ASS'Y	
1	30315-02C	1						PC CARD, ETCHED & DRILLED	
2	30315-03	REF						SCHEMATIC	
3	A257-00476-001	1						CONNECTOR, 20 PIN	3M # 3422-0000T
4	A257-00482-010	2						PC PIN	AUGAT # 8150-6P4
5	A257-00463-102	2						PIN SOCKET	BERG # 47743
6	A257-01475-021	4						SWITCH BASE	MARCOFLEX 6622
7	A257-01475-019	2						" "	" 6620
8	A257-01475-000	6						LAMP	" 1739
9	A257-01476-036	1						BUTTON, PAPR	MARCOFLEX
10	-037	1						" MAN	"
11	-038	1						" PRINT	"
12	-031	1						" PSE	"
13	-033	1						" RSET	"
14	-032	1						" RUN	"
15	A257-00693-050							20 CONDUCTOR CABLE	3M # 3365/20
16	A257-01407-010	1						CONNECTOR, 20 PIN	3M # 3421-3000
17	A257-00134-097	7						RESISTOR 10K 1/4W 5%	R1-R7

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 7/13/77	DWG. NO. 30315-01 REV. C
		CHKD. BY		
		APPRVD. BY		SHEET 1 OF

BILL OF MATERIAL

30222-01 | A

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30222-01	1						BATTERY ASSY	
1	14612-01	1	1					BATTERY CASE	
2	14612-02	1	1					BATTERY BRACKET	
3	257-00540-001	1	1					BATTERY	
4	257-01453-001	1	1					SWITCH	

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.	SYSTEMS CORPORATION
		DR. BY / DATE	
		CHKD. BY	DWG. NO. 30222-01 / REV. A
		APPRVD. BY	SHEET 1 OF 1

RUNING 40-21 23352-2

BILL OF MATERIAL

30102-01 B

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL					DESCRIPTION	MATERIAL
			1	2	3	4	5		
0	30102-01	1						BACKPLANE PC CARD ASS'Y	
1	30102-02B	1						PC CARD, ETCHED & DRILLED, WITH TERMINALS	
2	30202-03	REF						SCHEMATIC	
3	A257-00607-009	REF						19 TERMINALS	CTC # 2034-3-05
4	A257-01450-003	29						CONNECTOR, 55 PIN DUAL	AMP # 5193-172-26
5									
6									
7									

CUSTOMER
APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.	
DR. BY	DATE 7/26/7
CHKD. BY	
APPRVD. BY	

SYSTEMS CORPORATION

DWG. NO. 30102-01

REV. B

SHEET 1 OF 1

BILL OF MATERIAL

30201-00 B

<table>
<tr><th rowspan="2">ITEM</th><th rowspan="2">PART NO.</th><th rowspan="2">TOTAL QTY.</th><th colspan="5">QTY. AT LEVEL</th><th rowspan="2">DESCRIPTION</th><th rowspan="2">MATERIAL</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>0</td><td>30201-00</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>FRONT PANEL ASS'Y, LOGGER, B&F</td><td></td></tr>
<tr><td>1</td><td>30201-06</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>FRONT PANEL, METAL</td><td></td></tr>
<tr><td>2</td><td>30201-07</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>FRONT PANEL, PLASTIC</td><td></td></tr>
<tr><td>3</td><td>14607</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td>HINGE, HANDLE</td><td></td></tr>
<tr><td>4</td><td>14601-02</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td>HANDLE</td><td></td></tr>
<tr><td>5</td><td>30201-10</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td>INSERT, HANDLE</td><td></td></tr>
<tr><td>6</td><td>A257-01407-014</td><td>6</td><td></td><td></td><td></td><td></td><td></td><td>CABLE CLAMP</td><td>3M # 3484-1000</td></tr>
<tr><td>7</td><td>A257-01613-001</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>LATCH, SWELL</td><td></td></tr>
<tr><td>8</td><td>30314-01</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>KEYBOARD PC CARD ASS'Y</td><td></td></tr>
<tr><td>9</td><td>30314-11</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>" " " "</td><td></td></tr>
<tr><td>10</td><td>30315</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>" " " "</td><td></td></tr>
<tr><td>11</td><td>30313</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>THUMBWHEEL PC CARD ASS'Y</td><td></td></tr>
<tr><td>12</td><td>30312</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>DISPLAY PC CARD ASS'Y</td><td></td></tr>
<tr><td>13</td><td>30201-01</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>DOOR, METAL</td><td></td></tr>
<tr><td>14</td><td>30201-02</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>DOOR, PLASTIC</td><td></td></tr>
<tr><td>15</td><td>30029</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>HINGE, DOOR</td><td></td></tr>
<tr><td>16</td><td>30201-08</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>EGGCRATE (10 POS)</td><td></td></tr>
<tr><td>17</td><td>30201-09</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td>EGGCRATE (1 POS)</td><td></td></tr>
<tr><td>18</td><td>257-01455-005</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>SWITCH, KEYLOCK</td><td>CHICAGO # 4073-2</td></tr>
<tr><td>19</td><td>257-01455-006</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td>" "</td><td>" # 4235 SPDT</td></tr>
<tr><td>20</td><td>257-01617-008</td><td>6</td><td></td><td></td><td></td><td></td><td></td><td>SPACER, NYLON 5/16 OD X 1/4 LG X .171</td><td>AMATOM # 9286-N-171</td></tr>
<tr><td>21</td><td>257-01617-005</td><td>6</td><td></td><td></td><td></td><td></td><td></td><td>STANDOFF, NYLON 1 1/8 LG X 5/16 OD. X #6-32</td><td>AMATOM # 8343-N-0632</td></tr>
</table>

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 7/1/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30201-00

REV. B

UNING 40-21 23352

OPERATING INSTRUCTIONS

ADTECH POWER MODEL NO.'S APS5-3 THRU APS28-9

ADTECH POWER
INCORPORATED
1621 South Sinclair Street • Anaheim, California 92806 • (714) 634-9211

Description: The APS Series is a series regulated, solid state power supply designed to provide adequately regulated DC voltages in all popular voltage and current levels. The output is floating and may be referenced to another low voltage, common, ground or be placed in series with another DC voltage.

Features: 115/230 Vac input, 47 - 440 Hz operation
Excellent regulation, typically .1 to .05% line or load
0.1% ripple
Current limit adjust
Voltage adjust pot
Temperature compensated circuitry
Optional overvoltage protection

Operating Procedure: Connect 115 Vac, 47 - 440 Hz to terminals 1 and 4 of transformer. Connect safety ground to solder lug on transformer mtg. leg.
For 230 Vac input, remove jumpers on transformer between 1 & 3 and 2 & 4. Then jumper terminals 2 and 3 together and connect 230 Vac to terminals 1 and 4. Suggest twisted AC input wires if electrical noise reduction is prime concern.

Output terminals are located on printed circuit board on APS series are marked + and -. Load should be connected to these terminals with due care to proper wire size and solid electrical connection for best results.

Suggested Test Procedure: Connect AC input power as outlined in operating procedure. Place a variac between Vac source and input. Place an AC voltmeter across transformer input terminals 1 and 4. Set input voltage for nominal 115 Vac with variac.

Place resistive load across output, check Vdc output specifications. DC voltmeter should be connected directly across output terminals. Do not run load current through measurement leads and do not measure at the load end of load leads. Greatest test errors are made at this point. Load leads must be kept short and connections as solid as possible. Resistive drops in load leads cause regulation errors. Output voltage may require adjustment. This can be accomplished by pot on PC board.

On the larger models (APS 5-6 thru 28-4) remote sensing is available. To utilize the remote sensing, if needed, disconnect the jumper wires from the output terminals to the sense terminals on the PC board. Run #22 AWG wires from each sense terminal to the remote point at which tightest regulation is desired. Be extremely careful to OBSERVE POLARITY, a wrong polarity connection will result in maximum output voltage and possible equipment damage. Load wiring from the output terminals should be sized to

Note: Units are not internally fused. Fuse high side of input line with value recommended on reverse side.

provide a maximum total voltage drop of less than 0.25V (5V models) at full load (2-3% of output on higher voltage models). It is recommended that when using remote sensing a 27 OHM resistor be connected from each output terminal to it's respective sense terminal at the supply. This will prevent loss of control and excess output voltage in the event that the remote sense leads are accidentally broken or opened.

Line Regulation: With output voltage set at proper voltage (depending on model), reduce input Vac to 103.50 Vac and note output voltage. Total output voltage change should not exceed .2% or ± .10%.

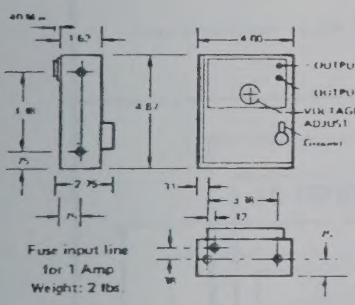
Load Regulation: Set AC input voltage to 115 Vac. Place DC voltmeter across output terminals. A load resistor, equal to the rated load of this supply at selected DC voltage setting, is then applied to output terminals. The voltage change should be noted. This differential change should not exceed .2% of DC output voltage. Output current adjust is factory preset. The fold back point of current limiting, is set for 10% to 30% above full load current rating.

Ripple: With voltage set at 115 volts and full load across DC output terminals, the measurable AC voltage on output should not exceed 0.1% or 5mV PK to PK (typically 1mV RMS max).

Suggested Practices: It is not required; however, chassis should be attached to other heat dissipating surfaces if full power over extended periods is desired.

APS SERIES DIMENSIONS All dimensions in inches.

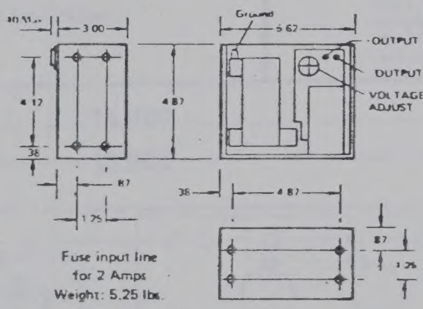
RED BARON: APS 5-3 thru 28-0.8


1.62
4.00
- OUTPUT
OUTPUT
VOLTAGE ADJUST
Ground
4.87
2.75
3.38
1.12

Fuse input line for 1 Amp
Weight: 2 lbs.

All Mounting Holes are 0.160 Dia.

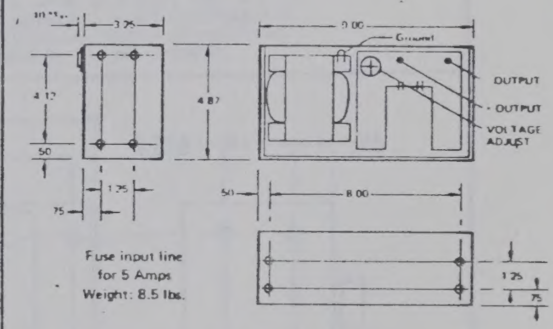
GREEN HORNET: APS 5-6 thru 28-2


3.00
Ground
5.62
- OUTPUT
OUTPUT
VOLTAGE ADJUST
4.12
4.87
.38
.87
1.75
.38
4.87
.87
3.25

Fuse input line for 2 Amps
Weight: 5.25 lbs.

All Mounting Holes are 0.218 Dia.

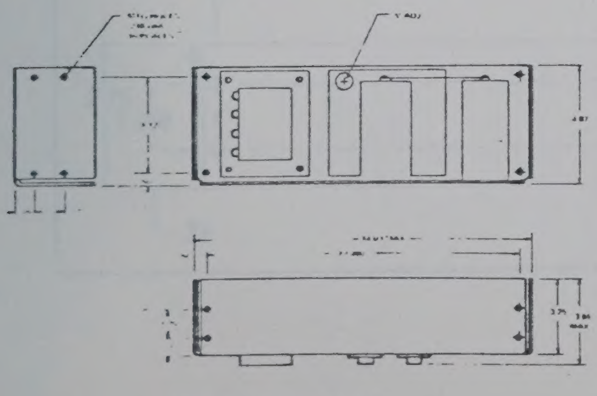
BLACK BEAUTY: APS 5-10 - 5-12 thru 28-4 except 5-18


3.25
9.00
Ground
OUTPUT
- OUTPUT
VOLTAGE ADJUST
4.12
4.87
.50
1.75
.75
.50
8.00
1.25
.75

Fuse input line for 5 Amps
Weight: 8.5 lbs.

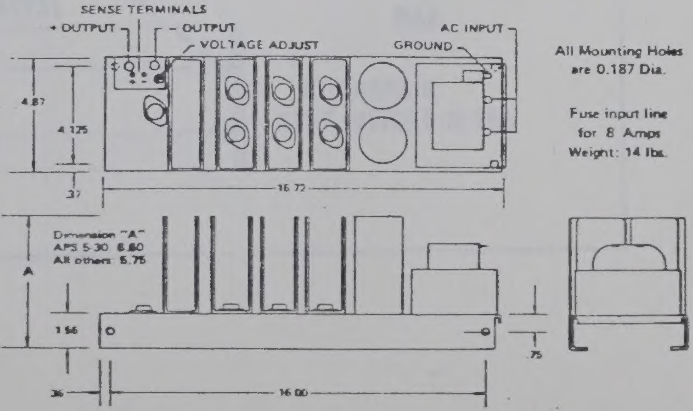
All Mounting Holes are 0.187 Dia.

BLACK BEAUTY: APS 5-18



All Mounting Holes are 0.218 Dia

BLUE MAX: APS 5-25 - 5-30 thru 28-9


SENSE TERMINALS
+ OUTPUT
- OUTPUT
VOLTAGE ADJUST
AC INPUT
GROUND
4.87
4.125
.37
16.72
Dimension "A"
APS 5-30 6.80
All others 5.75
A
1.56
.75
.36
16.00

All Mounting Holes are 0.187 Dia.

Fuse input line for 8 Amps
Weight: 14 lbs.

POWER-ONE, Inc.
531 DAWSON DRIVE
CAMARILLO, CALIF. 93010
(805) 484-2806

APPLICATION DATA INCLUDING:

1. Schematic
2. Parts List
3. Specifications
4. Outline & Mounting Dwg.
5. General User Information

MODEL

RE5-23/OVP

SPECIFICATIONS

AC Input: 105-125 VAC, 60 HZ.
See Table I for extended ratings

DC Output: 5.0 VDC, adjustable ± 5% minimum. See DC Output Current/Efficiency Chart for output current ratings.

Efficiency: See DC Output Current/Efficiency Chart.

Line Regulation: ± .01% for a 10% input change.

Output Ripple: 1.5mv PK-PK, 0.4mv RMS maximum.

Transient Response: 30 μ seconds for 50% load change.

Short Circuit & Overload Protection: Automatic current limit/foldback.

OVP: Built-in. Set at 6.2V ± .4V.

Reverse Voltage Protection: Provided on output & pass element.

Remote Sensing: Provided, open sense lead protection built-in.

Input Fusing: Recommended 3A.

Stability: ± .05% for 24 hours after warm up.

Temperature Rating: 0°C to 50°C full rated, derated linearly to 40% at 70°C.

Temperature Coefficient: ± .01%/°C maximum, .002% typical.

Vibration: Per Mil-Std-810B, Method 514, Procedure 1 curve AB (to 50HZ)

Shock: Per Mil-Std-810B, Method 516, Procedure V.

Load Regulation: ±.02% for 50% load change

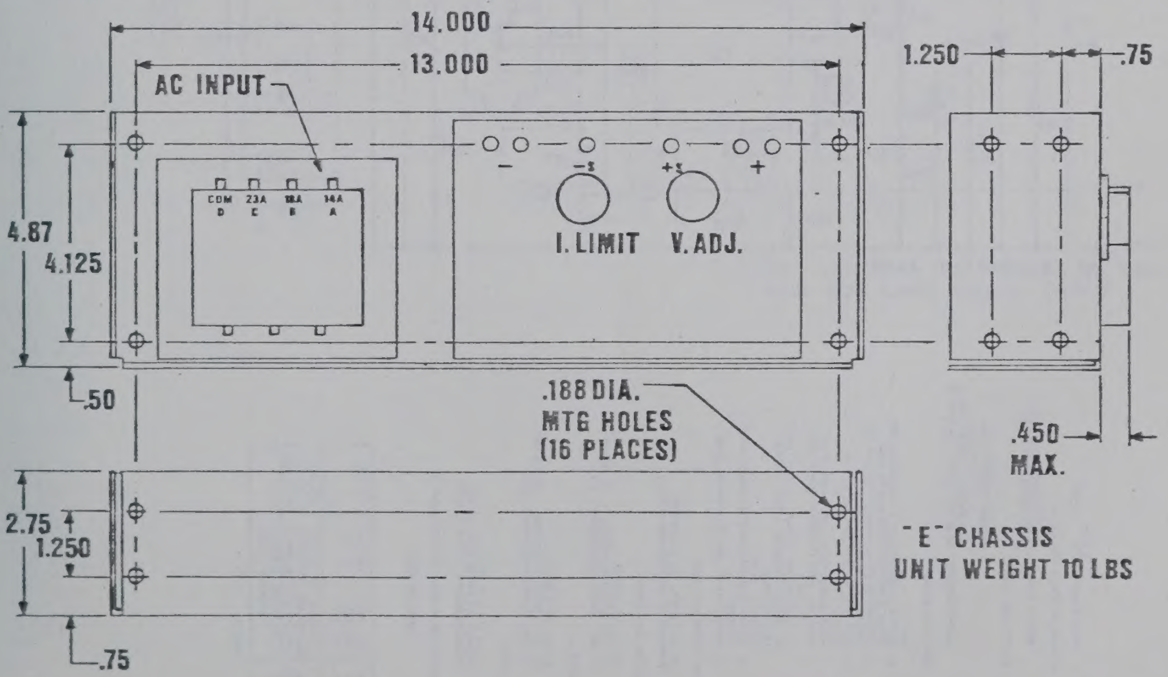
TROUBLESHOOTING GUIDE

Refer to voltage test points shown on schematic for ease of failure determination

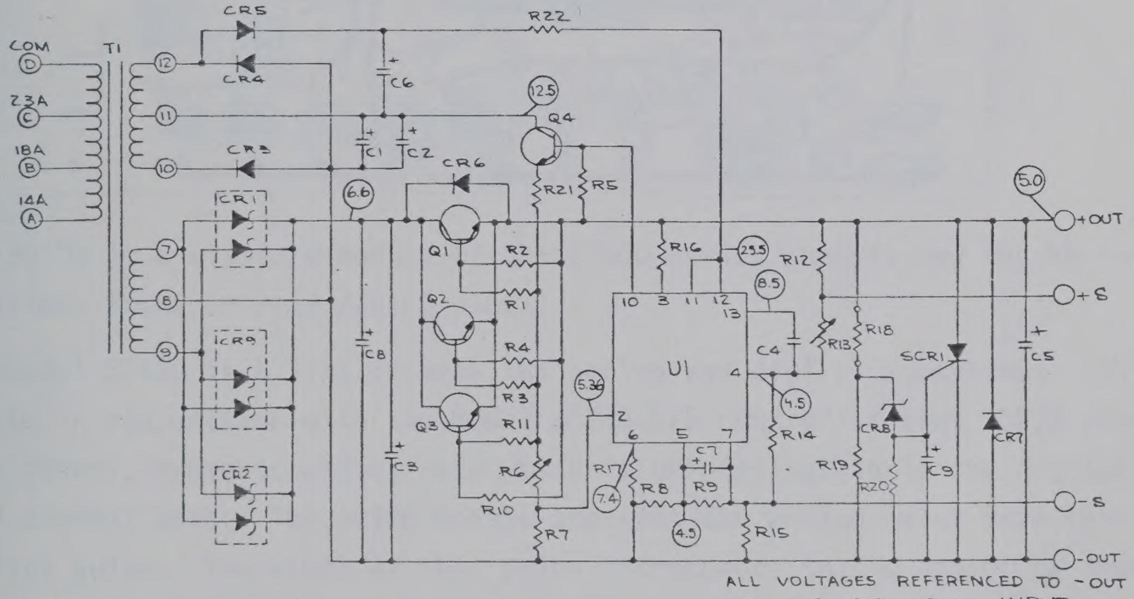
SYMPTOM	POSSIBLE PROBLEM
Unit Overheating	1) Output overloaded 2) Inadequate ventilation 3) Improper AC input voltage or frequency
Low Output Voltage With High Ripple	1) Output overloaded 2) U1 faulty 3) Open input rectifier 4) C1, 3, 6 or 8 leaky or open 5) Q1, 2, 3 or 4 open 6) - open sense lead protection resistor (R24) open
High Output Voltage and Ripple, Poor Regulation	1) + open sense lead protection resistor (R12) open 2) R13 set too high 3) Q1, 2, 3, or 4 shorted 4) U1 faulty
No Output	1) No input (blown fuse) 2) OVP fired (SCR 1 or SCR 2 shorted) 3) Load excessive or shorted
High Input Current, Blows Fuses	1) Improper input voltage or frequency 2) CR1, 2, 3, 4, 5 or 9 shorted 3) C1, 3, 6 or 8 shorted

2 YEAR GUARANTEE

POWER-ONE will repair or replace any power supply of its manufacture that does not perform to published specifications as a result of defective materials or workmanship for a period of 2 years from date of original purchase. No other obligations or liabilities are implied or expressed. Returns must be freight prepaid.



REF DES	RES-23/OVP			DESCRIPTION
C1,2,5	1000/16			CAPACITOR, ALUM. ELECT.
C3	90,000/10			ALUM. ELECT.
C6	220/16			ALUM. ELECT.
C7,9	10/25			ALUM. ELECT.
C4	.001/100			MYLAR
C8	90,000/10			CAPACITOR, ALUM. ELECT
CR1,9,2	R3020T			SCHOTTKY DIODE BRIDGE
CR3,4,5,6	AE1C			DIODE, 1A, 200V
CR7	AE3B			DIODE, 3A, 100V
CR8	1N752A			DIODE
Q1,2,3,4	2N3771			TRANSISTOR
SCR1	S0508LS3			SCR 8A
U1	μa723.			I.C. VOLTAGE REGULATOR
R12,15	6.8Ω			RESISTOR 1/2W, 5%, CARBON
R1,3,11	3.9Ω			
R2,4,10	22Ω			
R5,7	2.2K			
R8	2.2K			
R9	3.3K			
R16	220Ω			
R18,	6.8Ω MAY BE TRIMMED IN TEST			
R19	2.2K			
R14	4.7K			RESISTOR, 1/2W, 5%, CARBON
R6,13	1.5K			POTENTIOMETER
R17,22,20	47Ω			RESISTOR, 1/2W, 5%, CARBON
R21	.5Ω			RESISTOR, 1/2W, 5%, CARBON
T1	12516			
P.C.B.	12524			P.C. BOARD
CHASSIS	11051			CHASSIS, ALUM



ALL VOLTAGES REFERENCED TO -OUT
WITH 23A LOAD, 115VAC INPUT.

Table 1

MODEL	AC INPUT TAP	DC OUTPUT CURRENT, EFFICIENCY @ NOMINAL LINE		
		AC Input: 105-125 VAC, Standard	AC Input: 98-125 VAC, Extended	AC Input: 91-125 VAC, Extended
RDS-15/OVP	A B C	9A, 65% 12A, 63% 15A, 60%	 9A, 64% 12A, 58%	 9A, 61%

OPERATING NOTES

INPUT TAP SELECTION FOR AC VARIATION (See Table 1)

Step 1) Determine maximum current required
Step 2) Estimate minimum AC input desired
Step 3) Select tap from Table 1

Example A

1) Max. current requirement: 11 A
2) Line variation expected: 100-125 VAC
3) Use tap C (12 A)

Example B

1) Max. current requirement: 8 A
2) Line variation expected: 105-125 VAC
3) Use tap A (9 A)

INPUT TAP SELECTION FOR STORAGE:

Step 1) Determine AC variation tap required
Step 2) Use next higher tap for storage

To Measure Storage Available:

1) Connect actual load (or expected load) to output
2) Connect test equipment, including oscilloscope to output
   Test Equipment:
   A. Digital Voltmeter - 10 volt scale
   B. Oscilloscope - sweep: 2 ms/cm, vert.: .2 V/cm
3) Reduce AC input to dropout (where pass elements saturate & ripple appears on output
4) Measure DC voltage from C3+ to +out (Approx. 1.5 V)
5) Increase AC input to minimum AC line expected & measure C3+ to +out voltage
6) Measure C3 decay slope in volts/milliseconds

Sample Calculation

Storage Voltage: DC @ min. Line 3.0V (see 5)
DC @ dropout -1.5V (see 4)

Storage Voltage= 1.5V

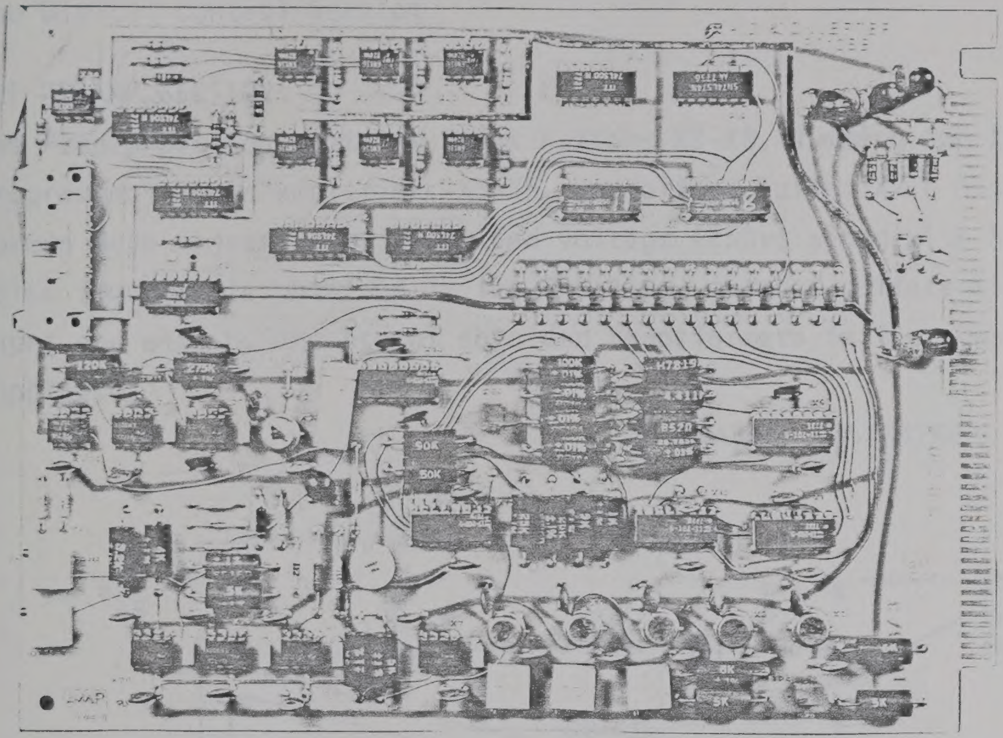
Storage Time Formula

$$\text{Storage Time (MS)} = \frac{\text{Storage Voltage (Volts)}}{\text{Decay Slope (Volts/MS)}}$$

Solution to Sample Calculation

$$\text{Storage Time} = \frac{1.5\ \text{V}}{.3\ \text{V/MS}} = 5\ \text{MS}$$

A/D CONVERTER - MODEL 30108



The 30108 is a standard module of the 27000 Series chassis and may be inserted in either front or rear facing slots.

The Model 30108 is a link between the analog and digital subsystems. This module in conjunction with the Model 30209 A/D controller (see 30209 product data sheet), converts analog data which is unintelligible to the digital section, into digital data. The 30108 Module converts the analog input data into a digital pulse. The width of this pulse corresponds to the amount of input voltage. The 30209 Module times the width of this pulse providing a 16 bit 2's compliment number

In general, the Model 30108 is a dual slope integrating pulse width modulating analog to digital converter. It incorporates a floating, guarded differential input, programmable gain from 1 to 400 in 8 steps, digital auto balance and span, and optical coupling to the digital section of the system.

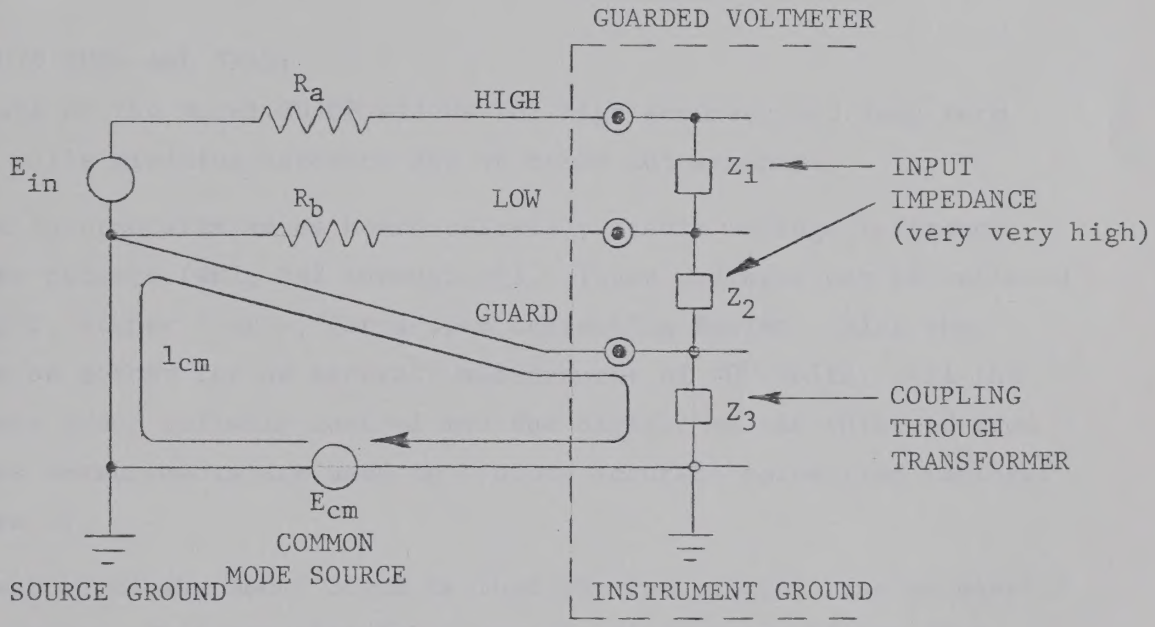
The Module may be broken down into three basic sections:

Model 30108 (continued)

The Preamp Section
The Reference and Integrator
The Digital Control Section

THE PREAMP SECTION:

The Preamp Section contains input buffers X2-X3, summing amp X4, programmable gain amplifiers X5-X6, and offset buffer X7. High common mode rejection (>120db) and voltage (250v) along with high noise immunity is obtained by the floating, guarded differential input and also by the use of shielded transformers in the power supplies.


GUARDED VOLTMETER
R_a
HIGH
E_{in}
R_b
LOW
GUARD
I_{cm}
Z_1
INPUT IMPEDANCE (very very high)
Z_2
Z_3
COUPLING THROUGH TRANSFORMER
E_{cm}
COMMON MODE SOURCE
SOURCE GROUND
INSTRUMENT GROUND

Common mode current is shunted through the guard wire and limited by the very high coupling impedance of the power supply to power ground. The maximum common mode voltage is largely determined by power supply design and breakdown limitations of exterior assemblies such as relays and wiring.

REFERENCE AND INTEGRATOR:

The preamplified input signal is clamped at 0 and 11v by X18 and cr2 to prevent erroneous readings. It is then buffered by X22 and allowed to charge integrator capacitor C10 with a constant current by X21 for 16.66 ms. At the end of this time, the input voltage is removed from X22 and held at 0v. At the same time a negative recharging current is

applied to the integrator via VR1, X20, and X23. The capacitor now discharges back to 0v at which time the cycle is complete. During this recharge time a pulse is generated, the width corresponding directly to the time the capacitor takes to discharge back to zero which in turn tells how much charge the capacitor contained from the current derived from the input voltage (see Figure 2).

DIGITAL SECTION:

The Digital Section contains the optical isolators which couple digital information between the analog and digital subsystems while maintaining isolated power supplys. It also contains proms X8 and X11 which along with X17 provide the logic for control of FET switches X1, X9, X12, X14, and X15.

DIGITAL AUTO ZERO AND SPAN:

This feature of the Model 30108 allows for high accuracy and long term stability while minizing hardware and on board adjustments.

The Module incorporates an on board extremely stable voltage reference and divider network (VR1, R42 through 49). These voltages can be switched to the input, either + or -, for a span correction factor. Also the inputs can be zeroed for an accurate measurement of "0" volts. All the above occurs under software control and the digital values obtained from the various measurements are used to produce accurate correction factors. (see Figure 3).

Another feature of the Model 30108 is that the integration time is exactly one 60 HZ cycle. This provides for a maximum attenuation of any line frequency noise which may be present.

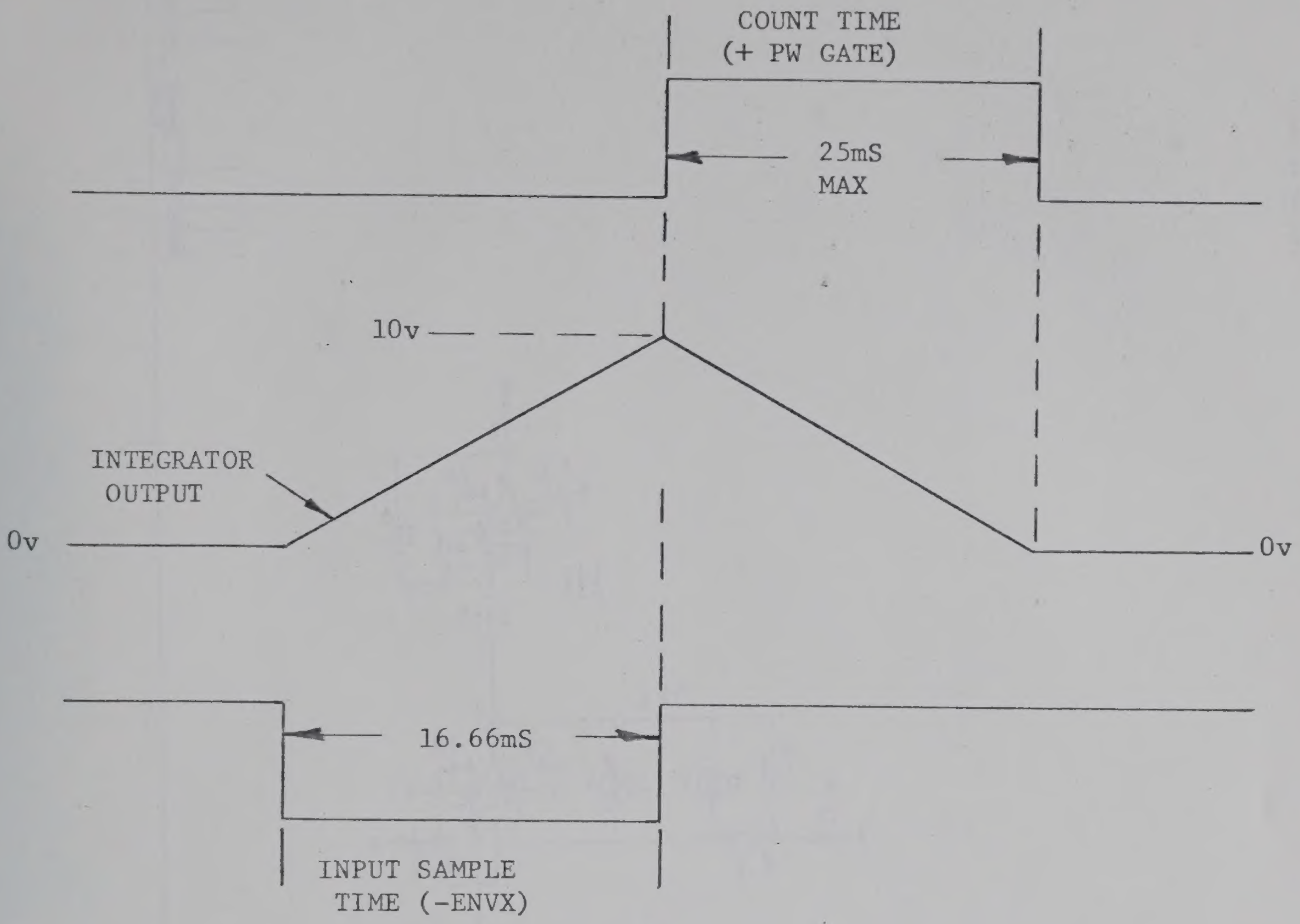
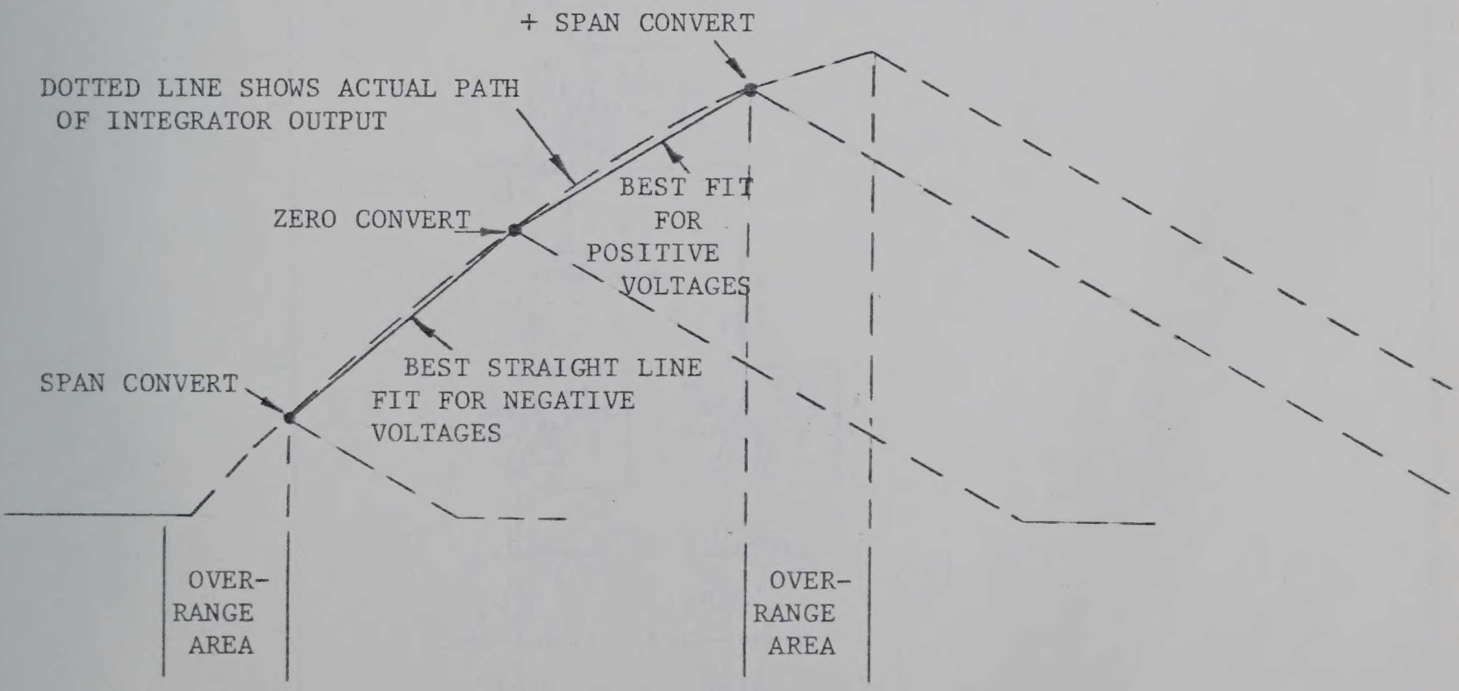
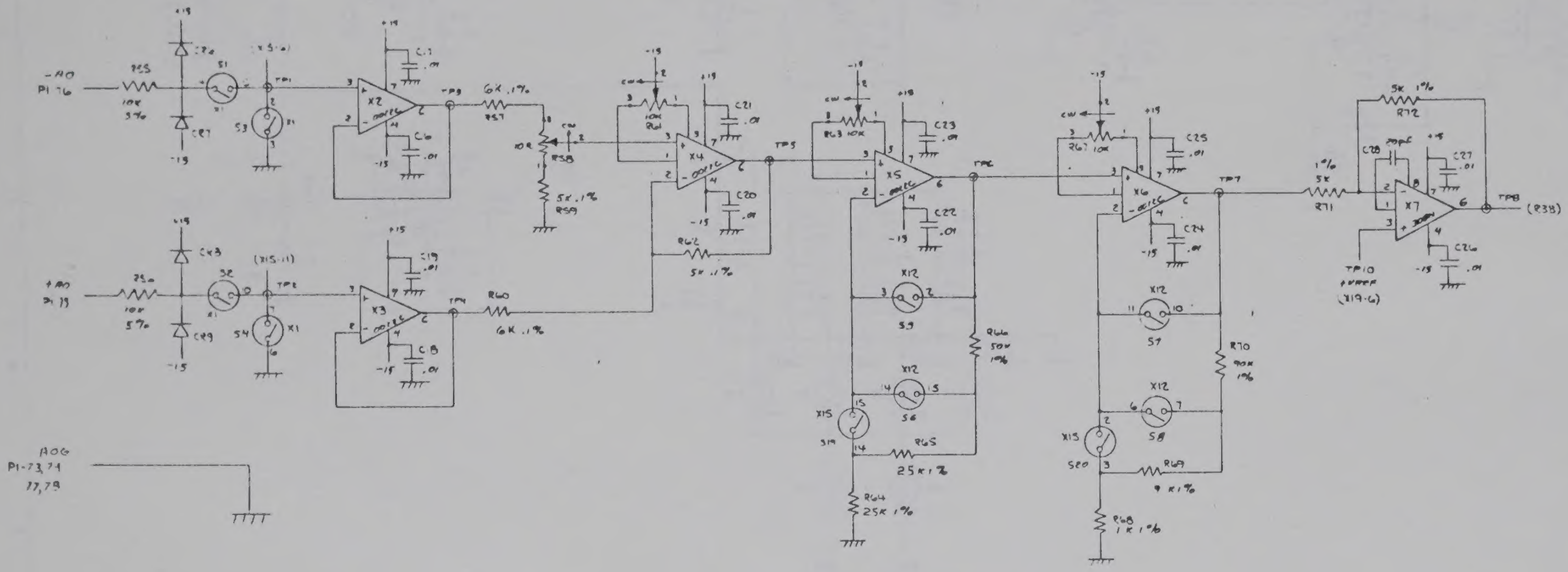

COUNT TIME
(+ PW GATE)
25mS
MAX
10v
INTEGRATOR
OUTPUT
0v
0v
16.66mS
INPUT SAMPLE
TIME (-ENVX)

FIGURE 2


+ SPAN CONVERT
DOTTED LINE SHOWS ACTUAL PATH
OF INTEGRATOR OUTPUT
BEST FIT
FOR
POSITIVE
VOLTAGES
ZERO CONVERT
BEST STRAIGHT LINE
FIT FOR NEGATIVE
VOLTAGES
SPAN CONVERT
OVER-
RANGE
AREA
OVER-
RANGE
AREA

ALL ERRORS GREATLY EXAGGERATED FOR CLARITY

FIGURE 3


-AO
P1 76
R55
10K
5%
+15
CR8
CR7
-15
S1
(X5-1)
TP1
S3
X1
X2
C17
.01
C16
.01
TP3
6K .1%
R57
10K
R58
CW
5K .1%
R59
X4
10K
R61
C21
.01
C20
.01
TP5
R62
5K .1%
+AO
P1 33
R56
10K
5%
CR8
CR9
S2
(X15-11)
TP2
S4
X3
C19
.01
C18
.01
TP4
R60
6K .1%
X5
R63 10K
C23
.01
C22
.01
TP6
X12
S9
S6
X15
S19
R66
50K
1%
R65
25K 1%
R64
25K 1%
X6
R67 10K
C25
.01
C24
.01
TP7
S7
S8
S20
R70
90K
1%
R69
9K 1%
R68
1K 1%
R71
5K
1%
R72
5K 1%
C28
30pf
C27
.01
X7
C26
.01
TP8
(R38)
TP10
(X19-6)
AOG
P1-73,74
77,79

SECOND SECTION

REVISIONS

ZONE	REV	E.C.O.	DESCRIPTION	DRFT	DATE	APPVD

SYSTEMS CORPORATION

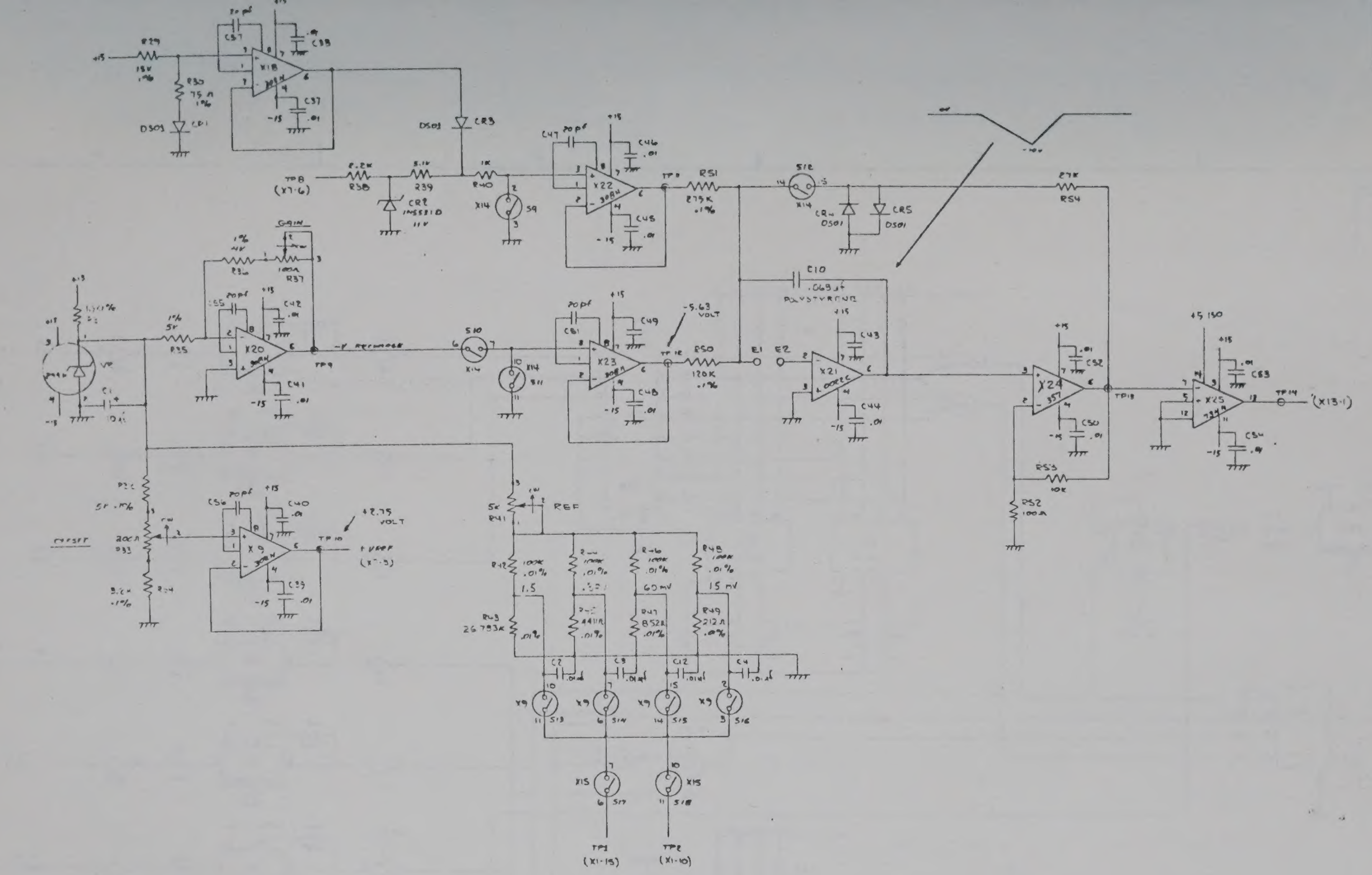
TITLE Schematic
A/D Converter

SIZE D PART NO 30105-C3 REV 2

SCALE SHEET 1 OF 3

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2

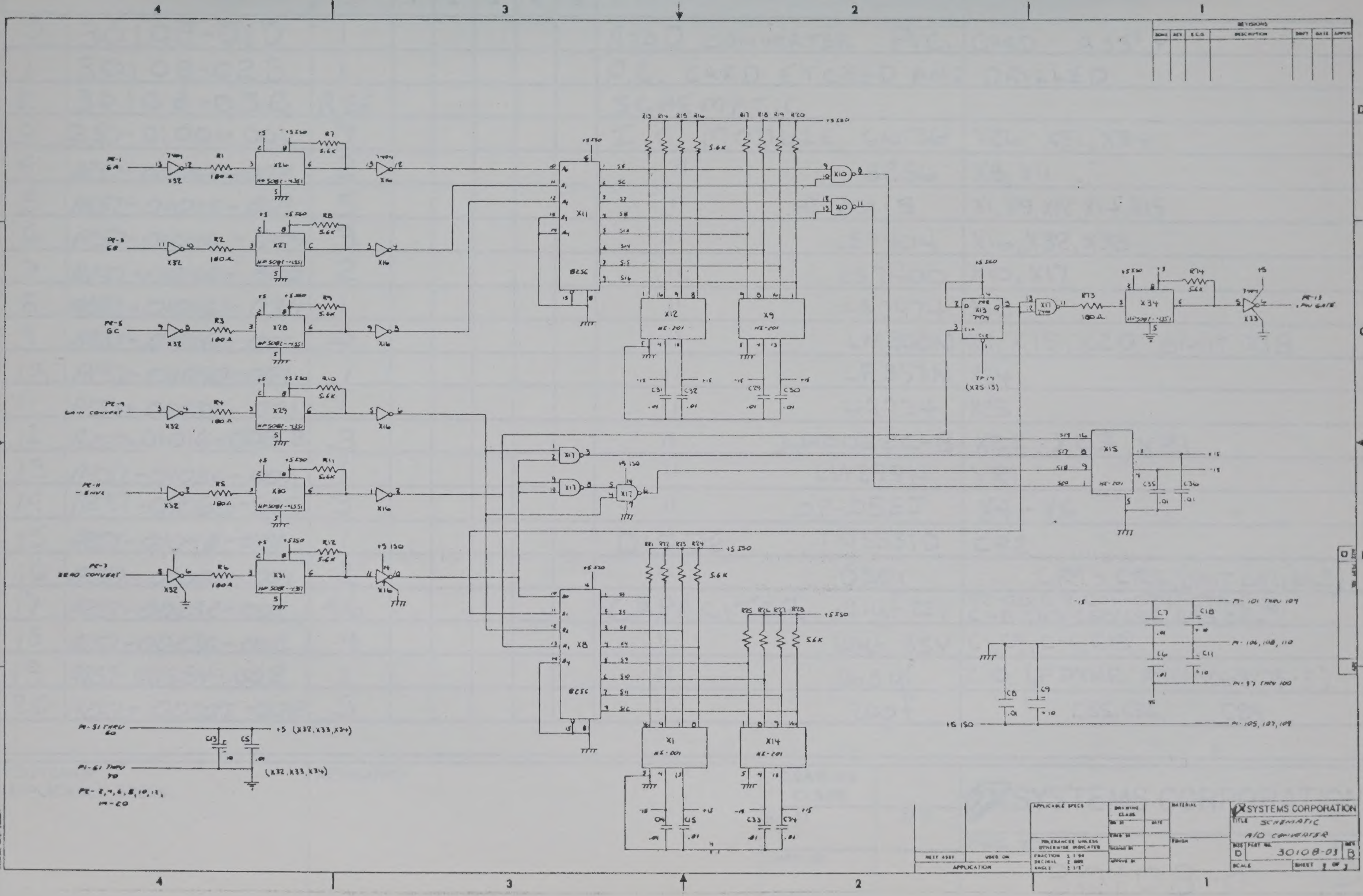
NEXT ASSY USED ON
APPLICATION


+15
R29
15K
1%
R30
75 Ω
1%
DS03
CR1
C57
20 pf
C38
.01
X18
C37
.01
-15
DS03
CR3
TP8
(X7-6)
R38
8.2K
5.1K
239
CR2
1N5531D
11V
1K
R40
X14
S9
C47
20 pf
+15
C46
.01
X22
308A
C45
.01
-15
TP8
R51
275K
.1%
S12
X14
CR4
DS01
CR5
DS01
27K
R54
-10V
GAIN
1%
4K
R36
100Ω
R37
VR
1.5K 1%
R3
C1
10 µf
1%
5K
R35
C55
20 pf
+15
C42
.01
X20
C41
.01
-15
TP9
-V REFERENCE
S10
X14
X14
S11
20 pf
C81
+15
C49
X23
308A
C48
.01
-15
-5.63 VOLT
TP12
R50
120K
.1%
E1
E2
C10
.069 µf
POLYSTYRENE
+15
C43
X21
LOOPEC
C44
.01
-15
+15
.01
C52
X24
357
C50
.01
-15
TP13
R53
10K
R52
100Ω
+5 150
+15
.01
C83
X25
734
C54
.01
-15
TP14
(X13-1)
R32
5K .1%
OFFSET
200Ω
R33
3.2K
.1%
R34
C56
20 pf
+15
C40
.01
X9
308A
C39
.01
-15
+2.75 VOLT
TP10
+VREF
(X7-5)
5K
R41
REF
R42
100K
.01%
1.5
R43
26.783K
.01%
R44
100K
.01%
R45
441Ω
.01%
R46
100K
.01%
60 mV
R47
852Ω
.01%
R48
100K
.01%
15 mV
R49
212 Ω
.01%
C2
.01 µf
C9
.01 µf
C12
.01 µf
C4
.01 µf
X9
S13
X9
S14
X9
S15
X9
S16
X15
S17
X15
S18
TP1
(X1-15)
TP2
(X1-10)

REFERENCE AND INTEGRATOR

APPLICABLE SPECS	DRAWING CLASS		MATERIAL	SYSTEMS CORPORATION
	DR BY	DATE		TITLE Schematic A/D CONVERTER
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH	SIZE D PART NO 33199-03 REV
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2	APPVD BY			SCALE SHEET OF

NEXT ASSY	USED ON
APPLICATION	

PE-1 GA
PE-3 GB
PE-5 GC
PE-9 GAIN CONVERT
PE-11 -ENBL
PE-7 ZERO CONVERT
X32
X16
X26
X27
X28
X29
X30
X31
HP 5082-4351
R1 180Ω
R2 180Ω
R3 180Ω
R4 180Ω
R5 180Ω
R6 180Ω
R7 5.6K
R8 5.6K
R9 5.6K
R10 5.6K
R11 5.6K
R12 5.6K
X11 8256
X8 8256
X12 NE-201
X9 NE-201
X1 NE-201
X14 NE-201
X15 NE-201
X10
X17
X13 7474
X34
X33
R13 180Ω
R14 5.6K
TP14 (X25 13)
PE-13 PAV GATE
C31 C32 C29 C30 .01
C4 C5 C33 C34 .01
C35 C36 .01
+5 S50
+5 150
-15 +15
PI-51 THRU 60
PI-61 THRU 70
+5 (X32, X33, X34)
(X32, X33, X34)
PE-2, 4, 6, 8, 10, 12, 14-20
C13 C5
PI-101 THRU 104
PI-106, 108, 110
PI-97 THRU 100
PI-105, 107, 109
C7 C18 C6 C11 C8 C9
15 150
REVISIONS
ZONE
REV
E.C.O.
DESCRIPTION
DRFT
DATE
APPVD
APPLICABLE SPECS
TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°
NEXT ASSY
USED ON
APPLICATION
DRAWING CLASS
DR BY
DATE
CHKD BY
DESIGN BY
APPVD BY
MATERIAL
FINISH
SYSTEMS CORPORATION
TITLE SCHEMATIC
A/D CONVERTER
SIZE D
PART NO. 30108-03
REV B
SCALE
SHEET 1 OF 3
A
B
C
D
1
2
3
4

BILL OF MATERIAL

30108-01 D

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30108-01D	1						AtoD CONVERTER P.C.	CARD ASS'Y
1	30108-02B	1						P.C. CARD ETCHED AND	DRILLED
2	30108-03C	REF						SCHEMATIC	
3	257-01001-001	7						I.C. MODULE 6N136	X26-X31, X34
4	A257-00065-002	2						" 8256	X8, X11
5	A257-01035-001	5						" HI-201-5	X1, X9, X12, X14, X15
6	A257-01046-004	3						" LS7404	X16, X32, X33
7	A257-01046-000	2						" LS7400	X10, X17
8	A257-01046-074	1						" LS7474	X13
9	A257-01016-001	3						" LM308N	X7, X19, X20' OMIT X18
10	A257-01050-001	1						" LF357N	X24
11	A257-00079-001	1						" UA734	X25
12	A257-01016-008 B	3						" LH0022C-B	X22, X23, X21
13	A257-01036-001	1						" LM299H	VR1
14	A257-01065-505	3						" OP-05EJ	X4-X6
15	A257-01048-001	1						DIODE 1N5531D	CR2
16	A257-00000-001	2						" DS01	CR4 - CR5 (OMIT CR1, CR3)
17	A257-00232-001	46						CAPACITOR .01uf 25V	C2-C8, C12, C14-C27, C29-C46, C48, C49, C50, C52, C53, C54
18	A257-00236-002	4						" 10uf 35V	C1, C9, C11, C13
19	A257-00254-002	1						" .068 uf	C10 (FDYNE PS11-.068-75-5)
20	A257-00207-008	3						" 20pf	C55, C56, , C28

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE	DWG. NO. 30108-01 — REV. D
		CHKD. BY		
		APPRVD. BY		SHEET 1 OF 3

BRUNING 40-21 23352

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
21								R29	OMIT
22								R30	OMIT.
23	A257-00148-057	1						" R38	2.2KΩ 2% 1/4 W
24	A257-00148-066	1						" R39	5.1KΩ 2% 1/4 W
25	A257-00148-075	1						" R40	100KΩ 2% 1/4 W
26	A257-00134-055	7						" R1-R6, R73	180Ω 5% 1/4 W
27	A257-00148-073	1						" R53	10KΩ 2% 1/4 W
28	A257-00148-025	1						" R52	100Ω 2% 1/4 W
29	A257-00134-073	2						" R55, R56	1KΩ 5% 1/4 W
30	A257-00120-070	1						" R54	27.4KΩ 1% 1/4 W
31	A257-00158-090	4						RESISTOR, PRECISION	5K 1% T.S. R32,R35, R71, R72
32	A257-00158-084	1						" "	3K 1% T.S. R36
33									
34	A257-01016-008A	2						I.C. MODULE LH0022C-A	X2, X3
35									
36	A257-00158-183	1						RESISTOR, PRECISION	900Ω 1% T.S. R70
37	A257-00157-197	3						"	500Ω .1% T.S. (R59, 62, R66)
38	A257-00159-121	4						" "	100KΩ .01% (R42, R44, R46, R48)
39	A257-00159-182	1						" "	26.783K .01% R43
40	A257-00159-183	1						" "	4.411K .01% R45
41	A257-00159-184	1						" "	852Ω .01% R47

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE	DWG. NO. 30108-01 / REV. D
		CHKD. BY		
		APPRVD. BY		SHEET 2 OF 3

BRUNING 40-21 23352

BILL OF MATERIAL

30108-01

D

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
42	A257-00159-185	1						RESISTOR PRECISION	212Ω .01% R49
43	A257-00157-085	1						" "	3.2K Ω .1% R34
44	A257-00157-123	1						" "	120KΩ .1% R50
45	257-00169-007	2						RESISTOR, VARIABLE	1K Ω R37, R33
46								" "	
47	257-00169-011	3						" "	20K Ω R61, R63, R67
48	257-00166-002	1						" "	1.0Ω VISHAY T.S. R58
49									R41 – JUMPER 2 TO 3
50	A257-01407-009	1						CONNECTOR, 20 PIN,	3M # 3428-1002
51	257-01051-001	4						DIODE 1N459A	CR6-CR9
52	257-00134-091	23						RESISTOR 1/4W 5.6K 5%	R7-R28, R74
53	257-00120-009	1						" 1/4W 1.5K 1%	R31
54	257-00158-185	1						" 1/4W 90Ω 1%	TS R69
55	257-00158-025	1						" 1/4W, 10Ω 1%	TS R68
56	A257-00157-192	1						" 1/4W, 275K, .1%	R51
57	A257-00157-196	2						" 1/4W, 600Ω .1%	R57, R60
58	A257-00158-184	2						" 1/4W, 250Ω 1%	R64, R65

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30108-01

REV. D

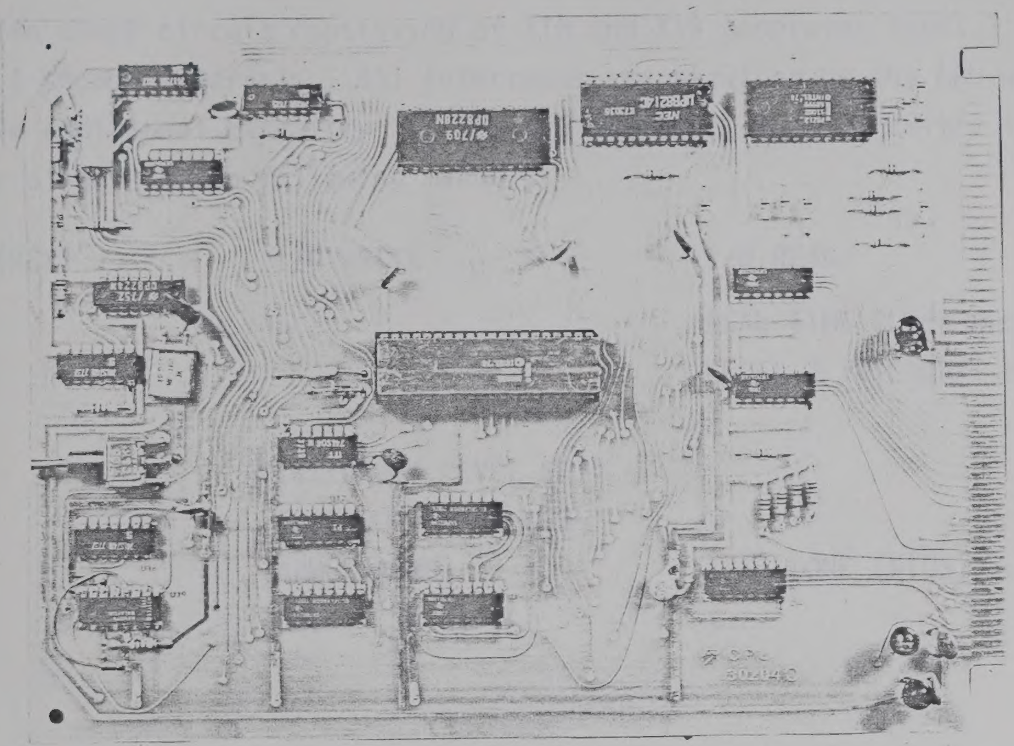
SHEET 3 OF 3

BRUNING 40-21 23352

fx bf INSTRUMENTS
SYSTEMS CORPORATION

PRODUCT DATA

CPU MODULE - MODEL 30204



The 30204, a standard module of the 27000 Series chassis, is generally used in one of the front facing slots.

The 30204 contains the CPU, both system clocks, and part of the system interrupt structure. The 8080 chip is a complete 8-bit parallel control processor unit (CPU). This chip contains the functional elements shown in the block diagram. In order to function as a system CPU, the 8080 requires the support circuitry shown on schematic diagram D-30204-03 which depicts all the CPU associated circuitry.

The Model 30204 operates by placing a 16-bit address on the bus corresponding to a memory location. If data is to be written to this memory location, the CPU places the appropriate 8-bit data on the bus and generates a memory write strobe ($\overline{\text{MEMW}}$). If data is to be read from this memory location, the CPU generates a memory read strobe ($\overline{\text{MEMR}}$) which allows the memory card to place its 8-bit data on the bus. The CPU reads this data from the bus within the memory read strobe. Similarly, the CPU may write to, or read from, I/O by

MODEL 30204 CPU (continued)

generating an I/O write strobe ($\overline{\text{IOW}}$) or an I/O read strobe ($\overline{\text{IOR}}$). The CPU is forced to location 0 (power-up routine) by either switch S1 or a power up circuit on the Prescaler, Model 30244.

A real-time clock circuit consisting of X18 and X19 generates level 1 interrupts at 1 second intervals. All interrupts are serviced by the CPU with the aid of the additional circuitry X8, X9, X13 and X14. This circuitry is treated as I/O locations in the following manner:

ADDRESS (HEX)	I/O WRITE	I/O READ
79		REAL TIME CLOCK RESET
7A		LEVEL 2 INTERRUPT RESET
7B		
7C	INTERRUPT LEVEL SET	
7D	INTERRUPT MASK SET	
7E	ARM (NARMS)	TEST DONE (NTDS)
7F	RESET (NRIS)	

WORD	OUT 1	ASS'Y	30204 (CPU)

ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
7D	125																

BIT	IDENTIFY	"1" CONDITION
BD 00	PRIORITY SELECT BIT 1	BINARY COMPLEMENT
BD 01	" " " 2	" "
BD 02	" " " 4	" "
BD 03	PRIORITY DISABLE	DISABLE
BD 04		
BD 05		
BD 06		
BD 07		
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		

WORD	IN 1	ASS'Y	30204 (CPU)

ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
7E	126																

BIT	IDENTIFY	"1" CONDITION
BD 00	DONE BIT 0	DONE
BD 01	" " 1	
BD 02	" " 2	
BD 03	" " 3	
BD 04	" " 4	
BD 05	" " 5	
BD 06	" " 6	
BD 07	" " 7	
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		

EXECUTION GENERATES NTDS AND LOADS
DONE BITS OF INTERRUPT STATUS

WORD	OUT 1	ASS'Y	30204 (CPU)

ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
7F	127																

BIT	IDENTIFY	"1" CONDITION
BD 00	RESET BIT 0	RESET INTERRUPT
BD 01	" " 1	
BD 02	" " 2	
BD 03	" " 3	
BD 04	" " 4	
BD 05	" " 5	
BD 06	" " 6	
BD 07	" " 7	
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		

EXECUTION GENERATES NRIS

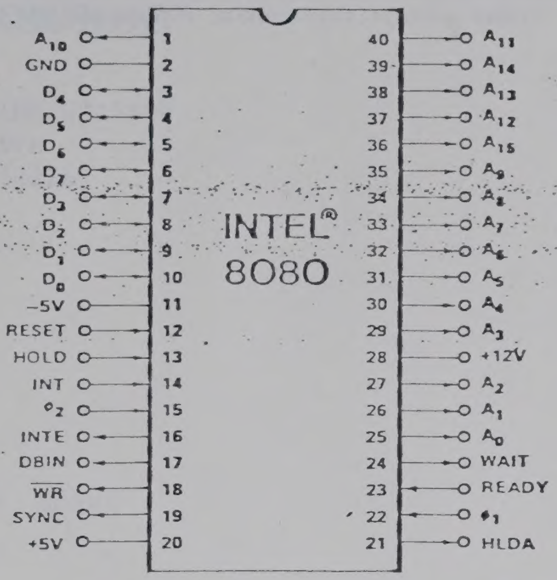
WORD	IN 1	ASS'Y	30204 (CPU)

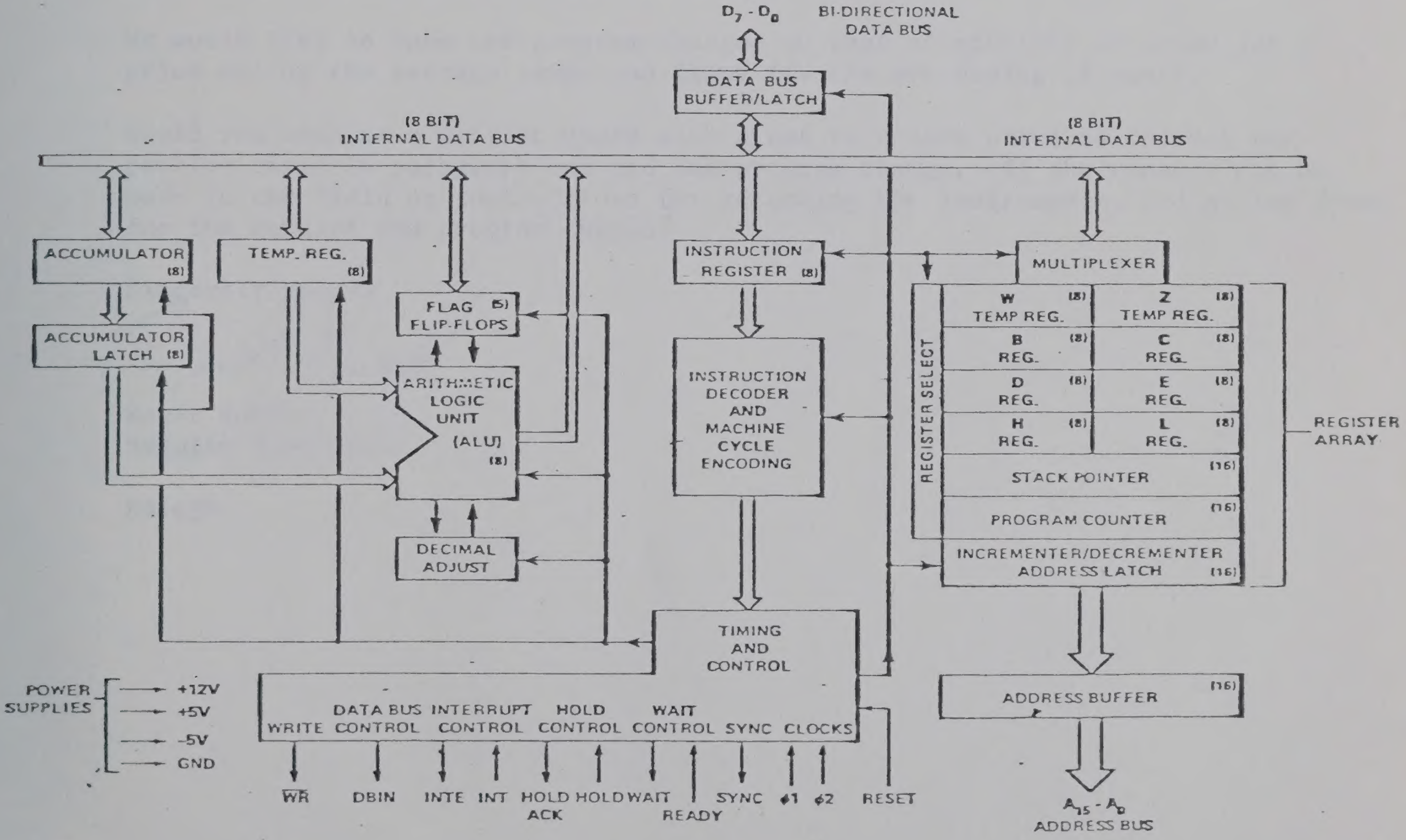
ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
79	121																

BIT	IDENTIFY	"1" CONDITION
BD 00	NONE	DON'T CARE
BD 01		
BD 02		
BD 03		
BD 04		
BD 05		
BD 06		
BD 07		
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		

INPUT STATEMENT RESETS REAL TIME CLOCK

INTERRUPT WHEN EXECUTED


INTEL® 8080
A10 1
GND 2
D4 3
D5 4
D6 5
D7 6
D3 7
D2 8
D1 9
D0 10
-5V 11
RESET 12
HOLD 13
INT 14
φ2 15
INTE 16
DBIN 17
WR 18
SYNC 19
+5V 20
40 A11
39 A14
38 A13
37 A12
36 A15
35 A9
34 A8
33 A7
32 A6
31 A5
30 A4
29 A3
28 +12V
27 A2
26 A1
25 A0
24 WAIT
23 READY
22 φ1
21 HLDA


D7 - D0
BI-DIRECTIONAL DATA BUS
DATA BUS BUFFER/LATCH
(8 BIT) INTERNAL DATA BUS
(8 BIT) INTERNAL DATA BUS
ACCUMULATOR (8)
TEMP. REG. (8)
ACCUMULATOR LATCH (8)
FLAG (5) FLIP-FLOPS
ARITHMETIC LOGIC UNIT (ALU) (8)
DECIMAL ADJUST
INSTRUCTION REGISTER (8)
INSTRUCTION DECODER AND MACHINE CYCLE ENCODING
MULTIPLEXER
REGISTER SELECT
W (8) TEMP REG.
Z (8) TEMP REG.
B (8) REG.
C (8) REG.
D (8) REG.
E (8) REG.
H (8) REG.
L (8) REG.
STACK POINTER (16)
PROGRAM COUNTER (16)
INCREMENTER/DECREMENTER ADDRESS LATCH (16)
REGISTER ARRAY
ADDRESS BUFFER (16)
A15 - A0 ADDRESS BUS
TIMING AND CONTROL
POWER SUPPLIES
+12V
+5V
-5V
GND
WRITE
DATA BUS CONTROL
INTERRUPT CONTROL
HOLD CONTROL
WAIT CONTROL
SYNC
CLOCKS
WR
DBIN
INTE
INT
HOLD ACK
HOLD
WAIT
READY
SYNC
φ1
φ2
RESET

2

Jacksonville Electric Authority

JEA
POWER TO SERVE

~~233 WEST DUVAL STREET • P. O. BOX 53015~~ • JACKSONVILLE, FLORIDA ~~3220~~XX

NORTHSIDE GENERATING STATION
4377 Heckscher Drive
Jacksonville, FL. 32226

January 20, 1981

FX Systems
77 Cornell Street
CPO Box 1818
Kingston, New York 12401

Gentlemen:

The present problems we are having with our B & F Instruments SY 76 Microcomputer Data Logger (FX Systems Type 27601-SY-76 serial 0040 MO 90084) are defective input relays, intermittent loss of program, and loss of program when opening front panel. Also, the printer appears to lose sync when reinstalled after a paper change. It just sits there making a horrible vibrating sound.

We would like to have the program changed so that at midnight we would get a print out of the average temps and flows for the preceeding 24 hours.

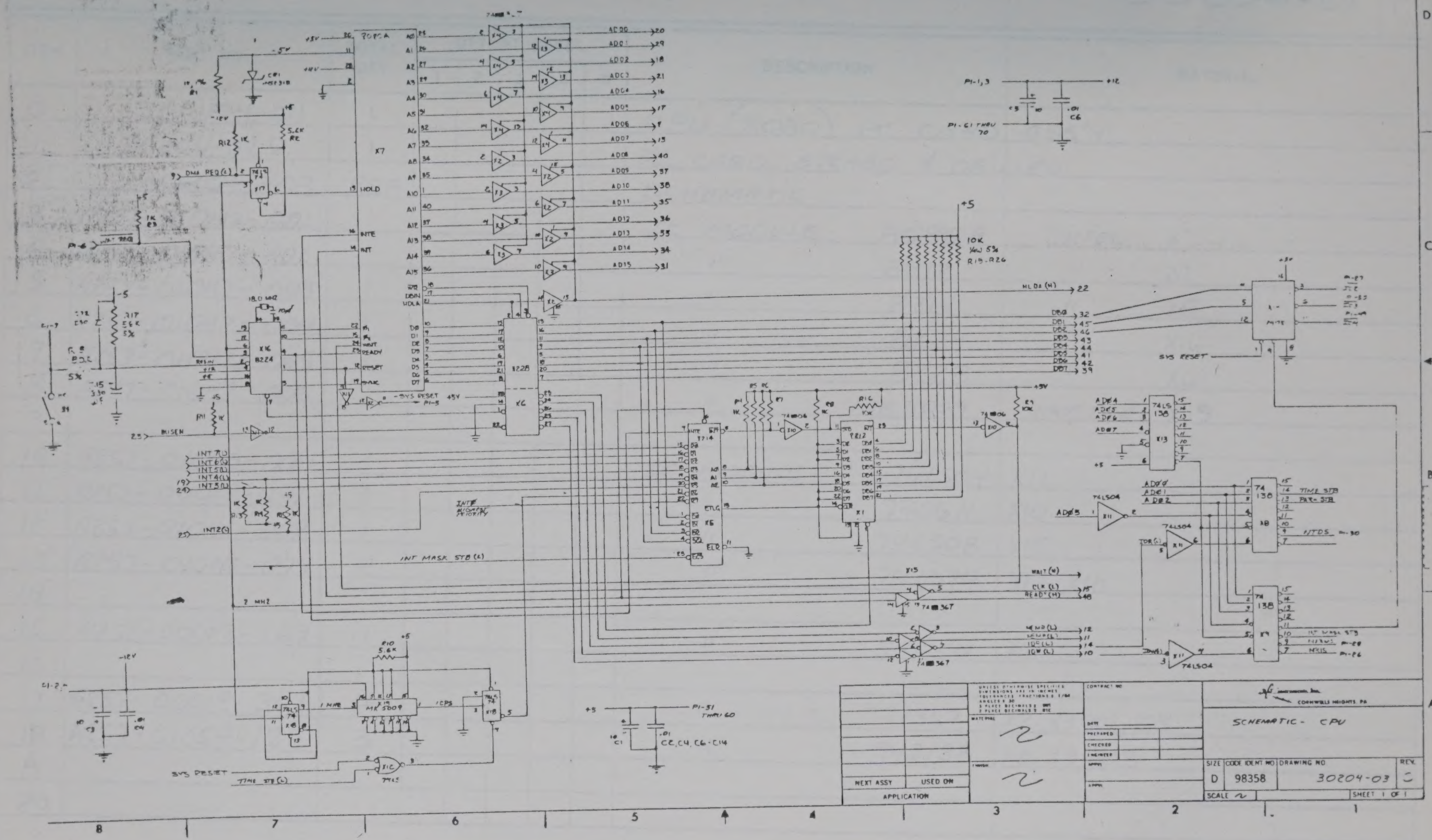
Would you send me a written quote with a not to exceed price to correct the problem cited in paragraph one and the program change, if the repairs can be made in the field or instructions for returning the instruments, and a time frame for the repairs and program change?

Sincerely yours,

Roger G. Smith

Roger Smith,
Results Supervisor

RS:cjh


8080A
X7
HOLD
INTE
INT
WR
DBIN
HLDA
READY
RESET
-SYS RESET P1-5
8224
X16
18.0 MHZ
8228
X6
8214
X5
8212
X1
74LS 138
X13
74 138
X8
X9
74LS04
74367
8T28
MK5009
1 MHZ
1 CPS
10K 1/4W 5% R19-R26
AD00
AD01
AD02
AD03
AD04
AD05
AD06
AD07
AD08
AD09
AD10
AD11
AD12
AD13
AD14
AD15
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
HLDA (H)
SYS RESET
DMA REQ (L)
BUSEN
INT 7(L)
INT 6(L)
INT 5(L)
INT 4(L)
INT 3(L)
INT 2(L)
INTE HIGHEST PRIORITY
INT MASK STB (L)
2 MHZ
WAIT (H)
CLK (L)
READY (H)
MEMR (L)
MEMW (L)
IOR (L)
IOW (L)
TIME STB
PAR- STB
INT MASK STB
TIME STB (L)
P1-1,3
P1-61 THRU 70
P1-51 THRU 60
C2, C4, C6-C14
+5
+12
-12V
-5V
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES FRACTIONS ± 1/64 ANGLES ± 30 3 PLACE DECIMALS ± .005 2 PLACE DECIMALS ± .010
CONTRACT NO
DATE
PREPARED
CHECKED
ENGINEER
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
instruments, Inc.
CORNWELLS HEIGHTS PA
SCHEMATIC - CPU
SIZE D
CODE IDENT NO 98358
DRAWING NO 30204-03
REV. C
SCALE
SHEET 1 OF 1
8
7
6
5
4
3
2
1
D
C
B
A

BILL OF MATERIAL

30204-01 | F

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30204-01	1						CPU (8080) PC CARD ASS'Y	
1	30204-02D	1						PC CARD, ETCHED & DRILLED	
2	30204-03	REF						SCHEMATIC	
3	A257-01047-001	1						IC MODULE 8080A	INTEL X7
4	A257-01047-002	1						" 8212	" X1
5	A257-01047-003	1						" 8214	" X5
6	A257-01047-004	1						" 8224	" X16
7	A257-01047-005	1						" 8228	" X6
8	A257-01047-006	1						" MK5009	MOSTEK X19
9									
10	A257-01046-004	1						IC MODULE 74LS04	X11
11	A257-00012-041	1						" 7406N	X10
12	A257-01046-008	1						" 74LS08	X12
13	A257-01046-074	2						" 74LS74	X17, X18
14									
15	A257-00012-169	1						" 74175N	X14
16									
17	A257-00012-367	4						" 74367	X2, X3, X4, X15
18	A257-01054-138	3						" 74S138	X8, X9, X13
19									
20									

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 7/22/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30204-01

REV. F

SHEET 1 OF 2

BRUNING 40-21 23352

BILL OF MATERIAL

30204-01 F

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
21									
22	A257-01002-004	1						DIODE, IN5231B	CR1
23	A257-00000-001	1						", DS-01	CR2
24									
25	A257-00303-007	1						CRYSTAL 18.0 MHZ	
26	A257-01404-005	1						SWITCH, TOGGLE	C&K # 7105ASYCB
27	A257-01457-001	1						SOCKET, 40 PIN	
28									
29									
30									
31	A257-00134-073	19						RESISTOR, 1K, 1/4W, ±5%	R3-R8, R11-R15, R19-R26
32	A257-00134-091	2						" 5.6K " "	R2, R10
33	A257-00134-097	2						" 10K " "	R9, R16,
34	A257-00120-001	1						" 1K, ", 1%	R1
35	A257-00135-016	1						" 56K, 1/4W, 5%	R17
36	A257-00134-055	1						" 180Ω " "	R18
37									OR SPRAGUE GT-12 (3.3 TO 18pf)
38	A257-00255-002	1						CAPACITOR, TRIMMER- 5-20pf	C16 E.F. JOHNSON # 275-0320-005
39	A257-00236-002	3						CAPACITOR, 10μf	C1, C3, C5
40	A257-00232-001	11						" .01μf	C2, C4, C6-C14
41	A257-00209-017	1						" 100uf, 20V	C15

CUSTOMER
APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 7/22/77

CHKD. BY

APPRVD. BY

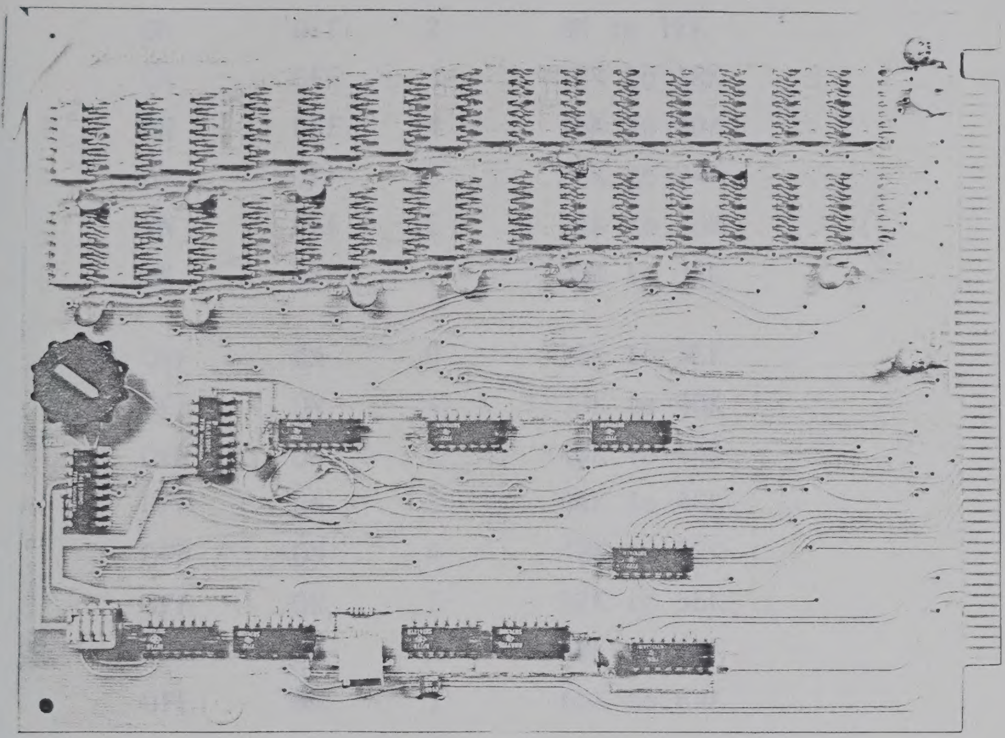
SYSTEMS CORPORATION

DWG. NO. 30204-01

REV. F

SHEET 2 OF 2

4K TTL RAM MODULE - MODEL 30206



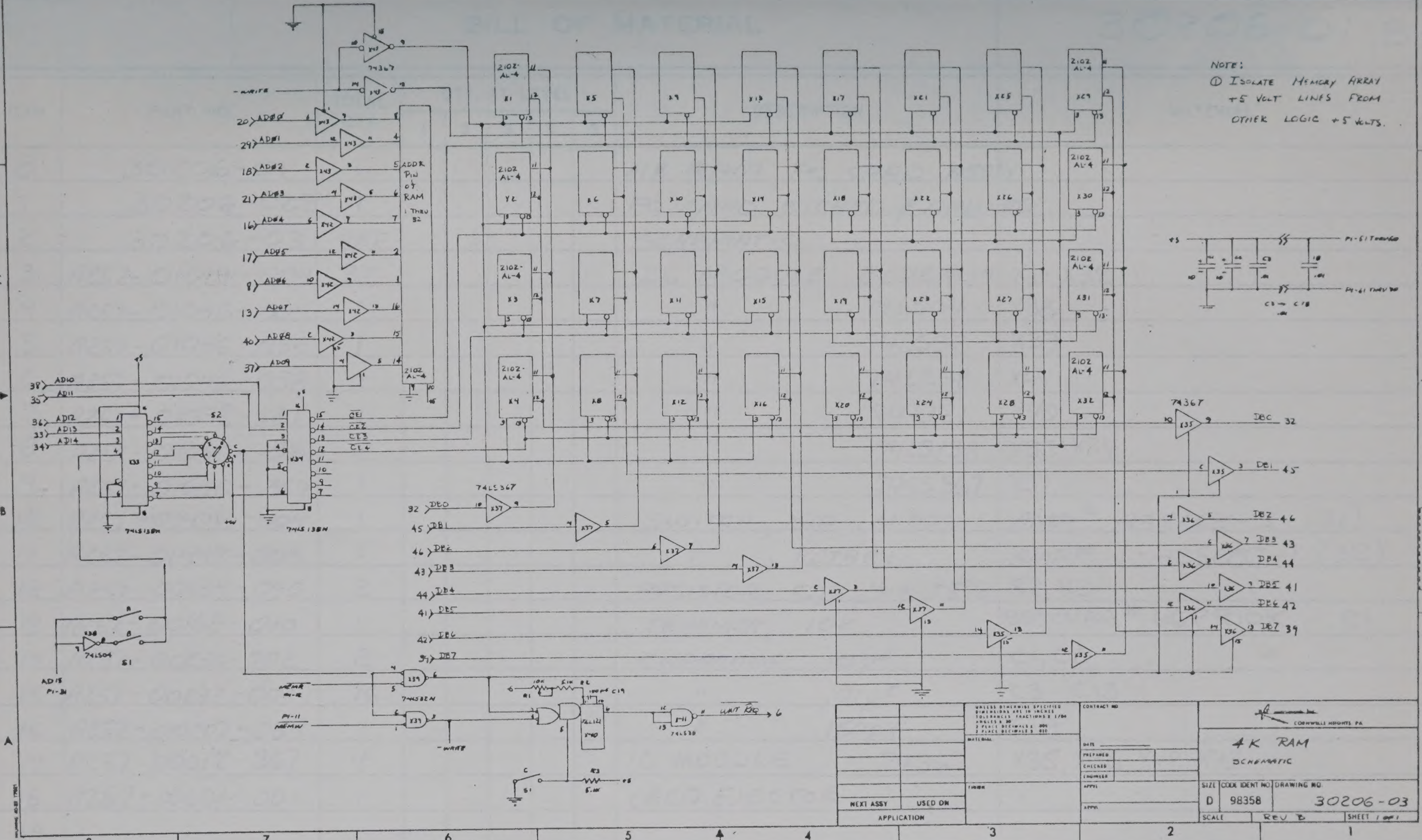
The 30206 is a standard memory module used for storage of user programmable parameters of the DAS system. It can be inserted in any 27000 Series chassis and is generally used in one of the front facing slots.

The Model 30206 contains 32 (thirty-two) 2102-AL-4 low power TTL 128 word by 8 bit memory chips, X1 thru X32. This memory is used as RAM (read/write/storage) in systems which do not require memory retention on loss of power. Note that special circuitry (X40, X41) is present which can cause a memory cycle extension of the CPU by means of the wait request signal (P1-6) in the event memories are used which have a minimum access time greater than that allowed by the CPU. Switch S3 can be open to defeat this feature, as it is not normally required.

The Model 30206 contains input address circuitry (X33, X34) which allows its 4K block of memory to start at any 4K partition level in the 64K memory map. Switches S1, S2, and S5 are used to select the starting address as follows:

MODEL 30206 (continued)

S1	S2	S5	BLOCK
ON	OFF	0	0 to 4K
ON	OFF	1	4K to 8K
ON	OFF	2	8K to 12K
ON	OFF	3	12K to 16K
ON	OFF	4	16K to 20K
ON	OFF	5	20K to 24K
ON	OFF	6	24K to 28K
ON	OFF	7	28K to 32K
OFF	ON	0	32K to 36K
OFF	ON	1	36K to 40K
OFF	ON	2	40K to 44K
OFF	ON	3	44K to 48K
OFF	ON	4	48K to 52K
OFF	ON	5	52K to 56K
OFF	ON	6	56K to 60K
OFF	ON	7	60K to 64K


-WRITE
74367
20) ADØØ
24) ADØ1
18) ADØ2
21) ADØ3
16) ADØ4
17) ADØ5
8) ADØ6
13) ADØ7
40) ADØ8
37) ADØ9
ADDR PIN of RAM 1 THRU 32
2102 AL-4
38) AD10
35) AD11
36) AD12
33) AD13
34) AD14
S2
X33
X34
74LS138N
CE1
CE2
CE3
CE4
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14
X15
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
X28
X29
X30
X31
X32
74LS367
32) DBØ
45) DB1
46) DB2
43) DB3
44) DB4
41) DB5
42) DB6
39) DB7
X35
X36
X37
74367
DBØ 32
DB1 45
DB2 46
DB3 43
DB4 44
DB5 41
DB6 42
DB7 39
+5
P1-51 THRU 60
P1-61 THRU 70
C3 → C18
.01
X38
74LS04
S1
AD15
P1-31
MEMR
P1-12
P1-11
MEMW
X39
74LS32N
10K
R1
5.1K
R2
100pf C19
74LS121
X40
X41
74LS30
WAIT REQ
6
-WRITE
C
S1
R3
5.1K
+5

NOTE:

① ISOLATE MEMORY ARRAY +5 VOLT LINES FROM OTHER LOGIC +5 VOLTS.

CORNWELLS HEIGHTS PA

4K RAM

SCHEMATIC

SIZE	CODE IDENT NO	DRAWING NO
D	98358	30206-03
SCALE	REV B	SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES FRACTIONS ± 1/64
ANGLES ± 30'
3 PLACE DECIMALS ± .005
2 PLACE DECIMALS ± .010

MATERIAL

FINISH

CONTRACT NO

DATE
PREPARED
CHECKED
ENGINEER
APPVL
APPVL

NEXT ASSY	USED ON
APPLICATION	

JOB NO.

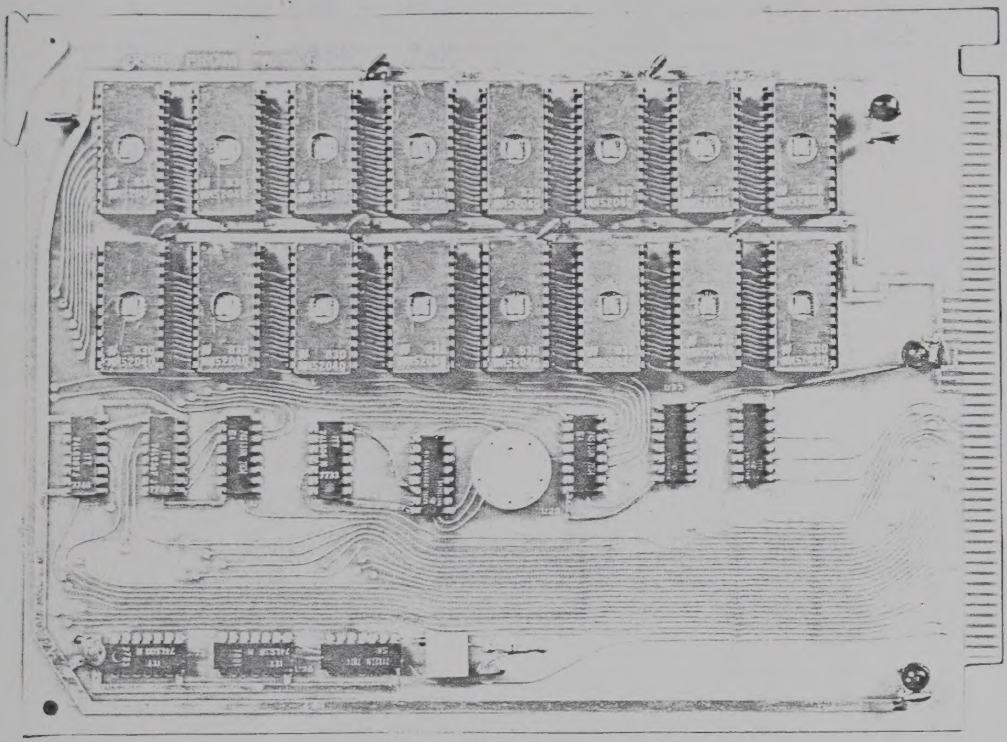
BILL OF MATERIAL

DWG. NO. 30206-01 B

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL					DESCRIPTION	MATERIAL
			1	2	3	4	5		
0	30206-01	1						4K RAM PC CARD ASS'Y	
1	30206-02B	1						PC CARD, ETCHED & DRILLED	
2	30206-03	REF						SCHEMATIC	
3	A257-01019-004	32						IC MODULE 2102AL-4	X1-X32
4	A257-01046-004	1						" 74LS04	X38
5	A257-01046-032	1						" 74LS32	X39
6	A257-01046-038	1						" 74LS38	X41
7	A257-01052-121	1						" 74L121	X40
8	A257-01046-138	2						" 74LS138	X33, X34
9	A257-01046-367	1						" 74LS367	X37,
10	A257-01478-004	1						SWITCH, DIP, 4 POS	AMP # 435668-3 (S1)
11	A257-01449-005	1						" , ROTARY	AMP # 1-435097-1 (S2)
12	A257-00134-090	2						RESISTOR, 5.1K, 1/4W, ±5%	R2, R3
13	A257-00169-010	1						TRIMMER, 10K	BECKMAN # 66PR10K R1
14	A257-00236-002	2						CAPACITOR, 10µf	C1, C2
15	A257-00232-001	16						" .01µf	C3 - C18
16	A257-00207-054	1						" 150pf	C19
17	A257-00012-367	4						IC MODULE 74367	X35, X36, X42, X43
18	A257-00601-001	1						CARD EJECTOR	
19									
20									

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 7/22/77	DWG. NO. 30206-01 REV. B
		CHKD. BY		
		APPRVD. BY		SHEET 1 OF 1

8K P/ROM MODULE - MODEL 30207



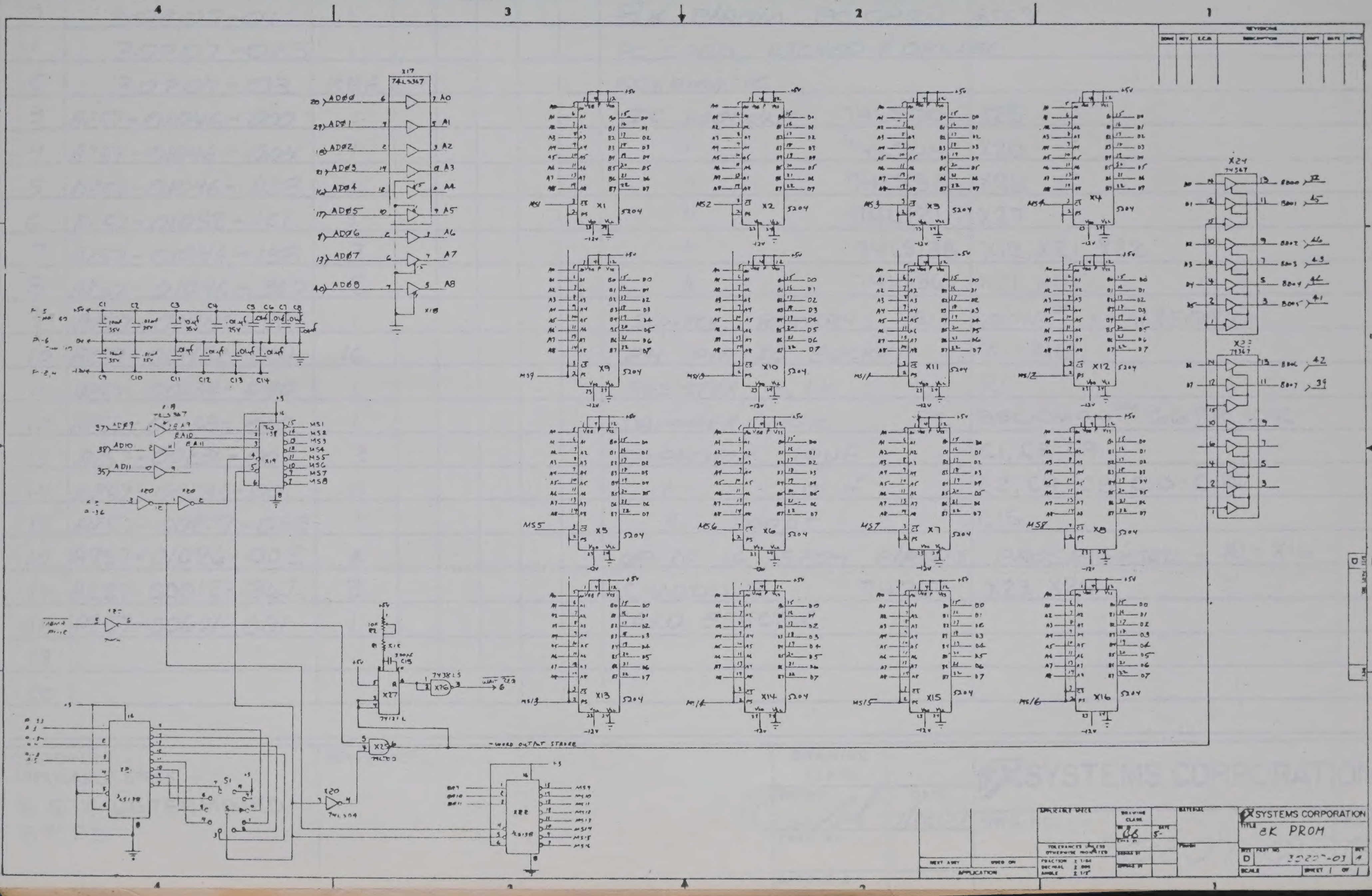
The 30207 is a standard memory module used for storage of the fixed operating system program. This P/ROM memory is non-volatile memory, not dependent upon Battery Backup systems for memory retention in event of power interruption. This card can be inserted into any 27000 Series chassis and is generally used in one of the front facing slots.

The Model 30207 contains 16 (sixteen) 5204 ultraviolet-erasable, electrically programmable 512 word by 8 bit read only memory chips, X1 thru X16, mounted in sockets. Note that special circuitry (X26, X27) is present which causes a memory cycle extension of the CPU by means of the wait request signal (P1-6). These memories have a minimum access time which is greater than that allowed by the CPU during a normal read cycle.

The Model 30207 contains input address circuitry (X19, X20, X21, X22) which allows its 8K block of memory to start at any partition level in the 64K memory field. Switch S1 is used to select the starting address as follows:

MODEL 30207 (continued)

S1	BLOCK
0	0 - 8K
1	8K - 16K
2	16K - 24K
3	24K - 32K
4	32K - 40K
5	40K - 48K
6	48K - 56K
7	56K - 64K



X17
74LS367
AD00
AD01
AD02
AD03
AD04
AD05
AD06
AD07
AD08
A0
A1
A2
A3
A4
A5
A6
A7
A8
X18
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14
X15
X16
5204
MS1
MS2
MS3
MS4
MS5
MS6
MS7
MS8
MS9
MS10
MS11
MS12
MS13
MS14
MS15
MS16
+5V
-12V
D0
D1
D2
D3
D4
D5
D6
D7
X24
74367
X23
74367
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
35V
.01uf
X19
AD9
AD10
AD11
X20
X21
X22
S1
X25
X26
X27
74LS04
74121
C15
WAIT
WORD OUTPUT STROBE

SYSTEMS CORPORATION

TITLE 8K PROM

DRAWING CLASS

DATE 5-

TOLERANCES UNLESS OTHERWISE INDICATED

FRACTION ± 1/64

DECIMAL ± .005

ANGLE ± 1/2°

SIZE D

PART NO 30207-03

SHEET 1 OF 1

JOB NO.	BILL OF MATERIAL	DWG. NO. 30207-01	REV. B

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30207-01	1						8K P/ROM PC CARD ASS'Y	
1.	30207-02B	1						PC CARD, ETCHED & DRILLED	
2	30207-03	REF						SCHEMATIC	
3	A257-01046-000	1						IC MODULE 74LS00	X25
4	A257-01046-004	1						" 74LS04	X20
5	A257-01046-038	1						" 74LS38	X26
6	A257-01052-121	1						" 74L121	X27
7	A257-01046-138	3						" 74LS138	X19, X21, X22
8	A257-01046-367	2						" 74LS367	X17, X18,
9	A257-01449-005	1						SWITCH, ROTARY (S1)	AMP# 1-435097-1
10	A257-00482-001	16						24 PIN IC SOCKET	X1-X16
11.	A257-00134-090	1						RESISTOR, 5.1K	R1
12	A257-00169-010	1						TRIMMER, 10K R2	BECKMAN # 66PR 10K
13	A257-00236-002	3						CAPACITOR, 10µf	C1, C3, C9
14	A257-00232-001	11						" .01µf	C2, C4-C8, C10-C14
15	A257-00207-068	1						" 300pf	C15
16	A257-01026-002	*						UP TO 16 5204 P/ROMS	PROGRAMMED X1-X16
17	A257-00012-367	2						IC MODULE 74367	X23, X24
18	A257-00601-001	1						CARD EJECTOR	
19									
20									

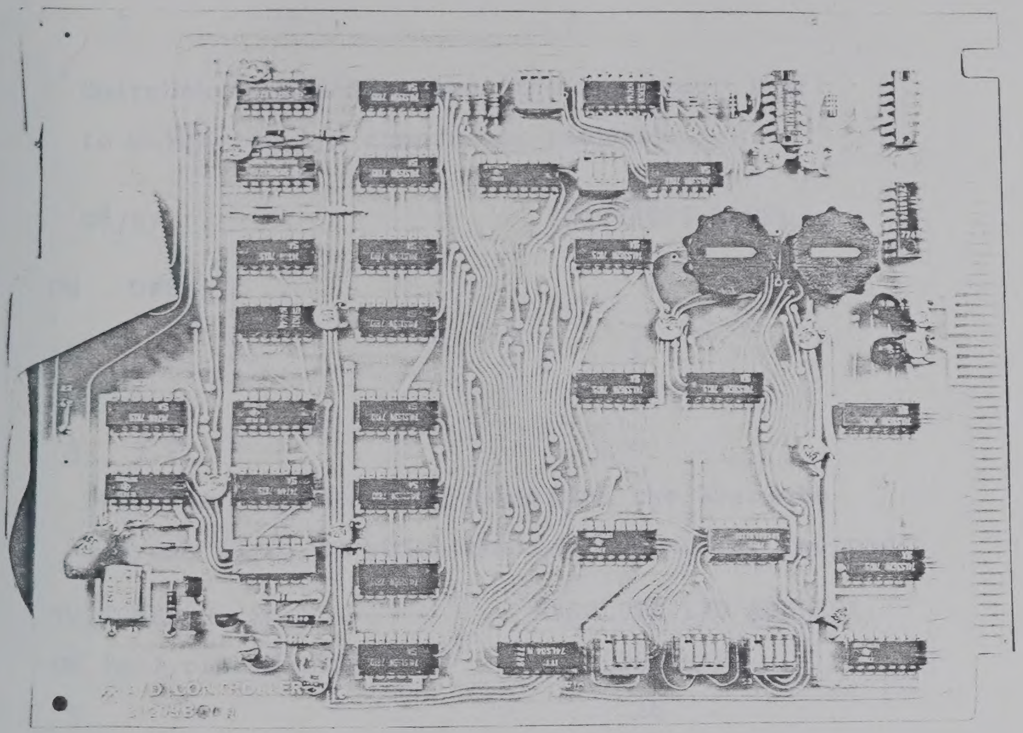
CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
* QTY. DETERMINED BY P.O.		DR. BY	DATE 7/22/77	DWG. NO. 30207-01 REV. B
		CHKD. BY		
		APPRVD. BY		

NING 40-21 23352

INSTRUMENTS
SYSTEMS CORPORATION

PRODUCT DATA

A/D CONTROLLER - MODEL 30209



The 30209 is a standard circuit module for the 27000 Series chassis and is intended for use in one of the front facing slots.

The Model 30209 is usually used in conjunction with the Model 30108 A/D Converter. The Model 30209 accepts a pulse width from the Model 30108 which it converts to a two's compliment signed binary 16-bit number, by enabling a counter which counts a crystal-controlled frequency for the duration of the pulse width.

Switches S1 and S2 provide for setting the interrupt identity of a particular A/D controller:

S1/S2	BIT
0	0
1	1
2	2
3	3
4	4

MODEL 30209 (continued)

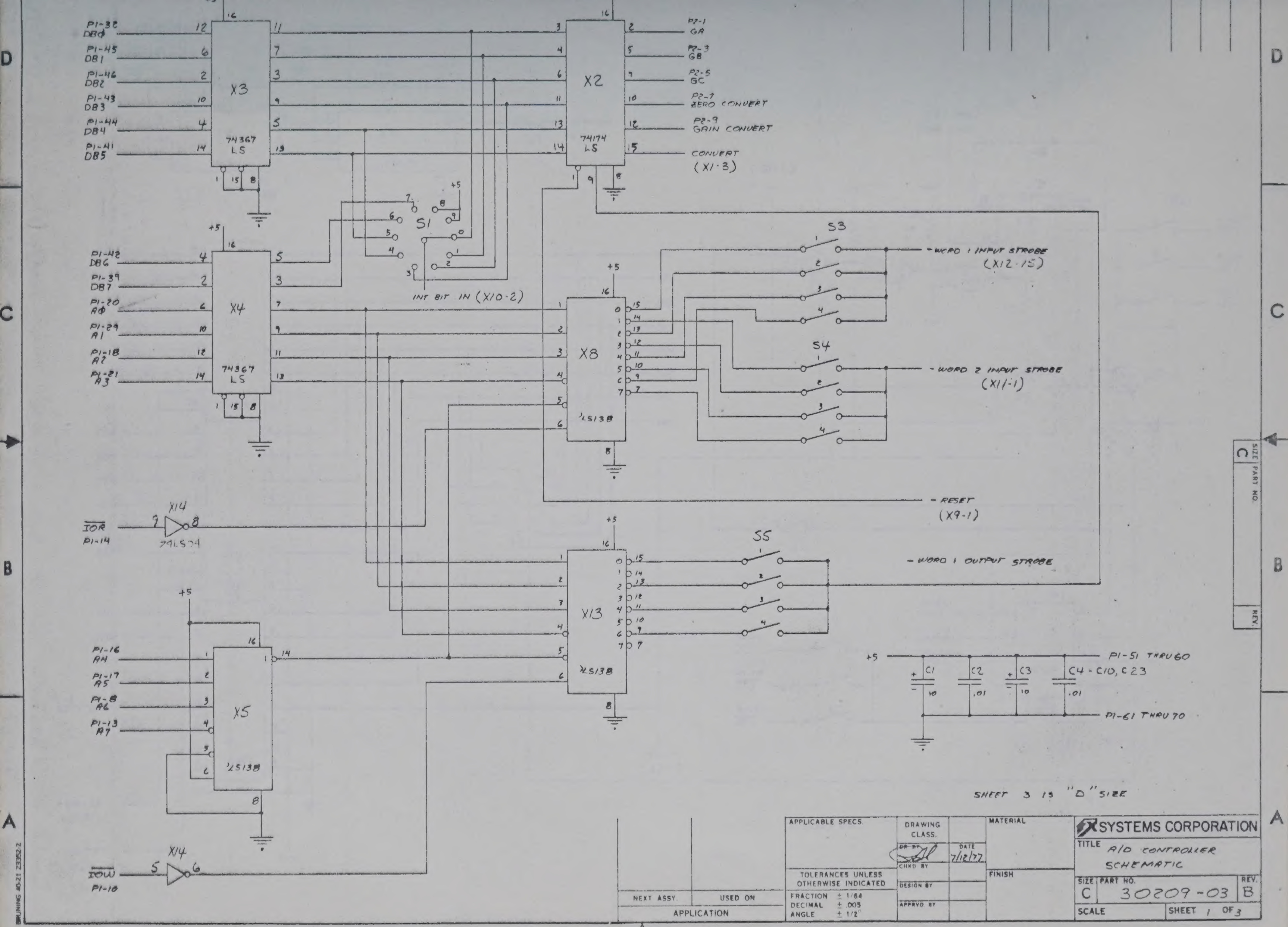
	S1/S2	BIT
*	5	5
	6	6
	7	7

Switches S6 and S7 select the interrupt level to which the A/D controller responds.

	S6/S7		INTERRUPT LEVEL
	ON	OFF	
*	1	2,3	2
	2	1,3	3
	3	1,2	4

Switches S3, S4 and S5 determine the absolute address (I/O) to which the A/D controller responds:

SWITCHES S3,S4,S5 ON (all others off)	ABSOLUTE I/O ADDRESS (DECIMAL)
1	16
2	17
3	18
4	19


P1-32 DBØ
P1-45 DB1
P1-46 DB2
P1-43 DB3
P1-44 DB4
P1-41 DB5
X3
74367 LS
X2
74174 LS
P2-1 GA
P2-3 GB
P2-5 GC
P2-7 ZERO CONVERT
P2-9 GAIN CONVERT
CONVERT (X1·3)
S1
+5
INT BIT IN (X10-2)
P1-42 DB6
P1-39 DB7
P1-20 AØ
P1-29 A1
P1-18 A2
P1-21 A3
X4
74367 LS
X8
'LS138
S3
- WORD 1 INPUT STROBE (X12·15)
S4
- WORD 2 INPUT STROBE (X11·1)
- RESET (X9-1)
IOR P1-14
X14
74LS04
X13
'LS138
S5
- WORD 1 OUTPUT STROBE
P1-16 A4
P1-17 A5
P1-8 A6
P1-13 A7
X5
'LS138
IOW P1-10
X14
+5
C1 10
C2 .01
C3 10
C4 - C10, C23 .01
P1-51 THRU 60
P1-61 THRU 70
D
C
B
A

SHEET 3 IS "D" SIZE

APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
	DR BY	DATE 7/12/77	
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DESIGN BY		
	APPRVD BY		

NEXT ASSY.	USED ON
APPLICATION	

SYSTEMS CORPORATION

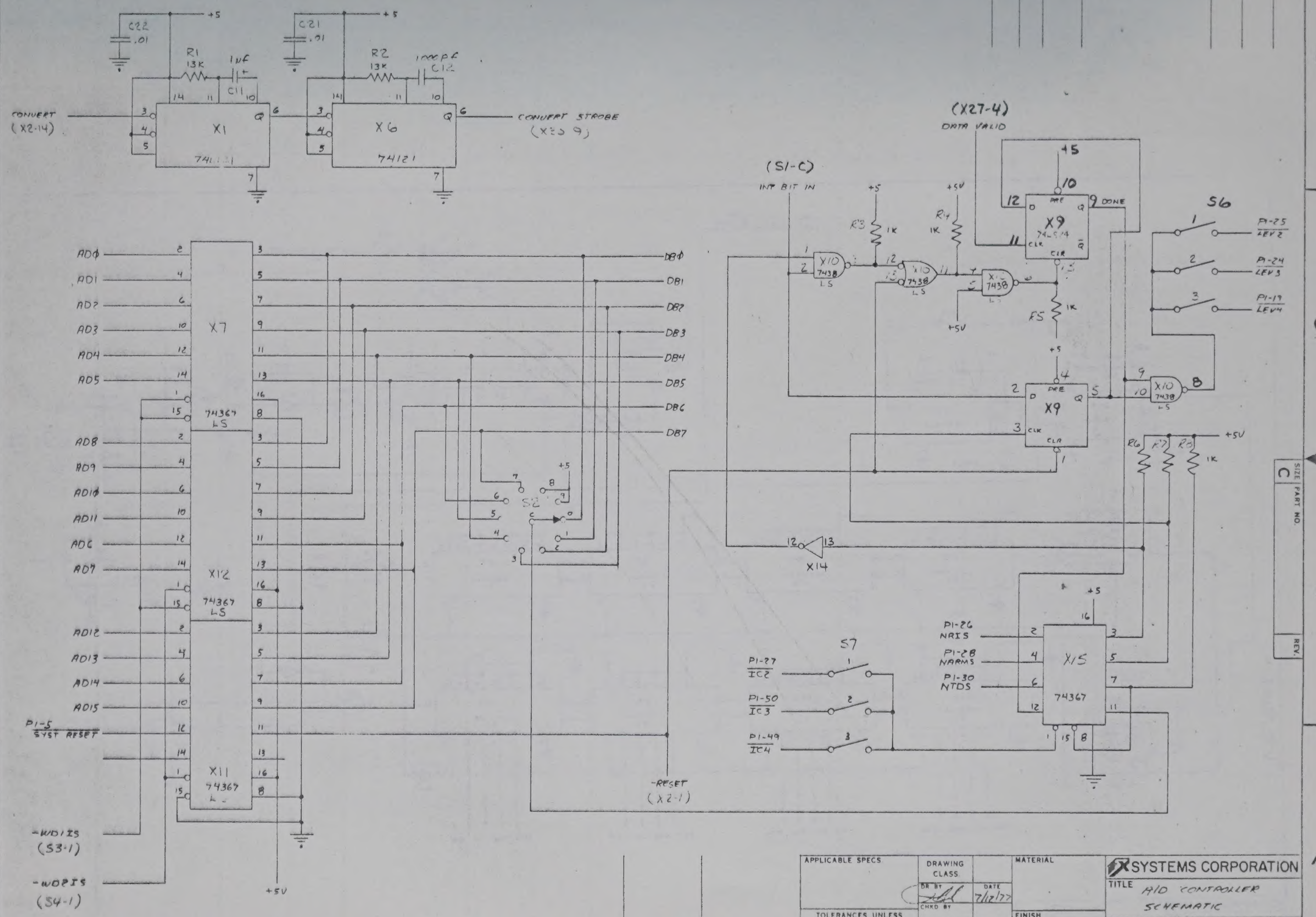
TITLE A/D CONTROLLER SCHEMATIC

SIZE C PART NO. 30209-03 REV. B

SCALE SHEET 1 OF 3

SIZE C PART NO. REV.

BRUNING 40-21 23052-2


C22 .01
+5
R1 13K
1uF C11
CONVERT (X2-14)
X1 74121
C21 .01
R2 13K
1000pF C12
X6 74121
CONVERT STROBE (X23 9)
(X27-4) DATA VALID
+5
X9 74LS74
DONE
(S1-C) INT BIT IN
R3 1K
R4 1K
X10 7438 LS
R5 1K
+5V
S6
P1-25 LEV2
P1-24 LEV3
P1-19 LEV4
X9
R6 R7 R8 1K
+5V
AD0
AD1
AD2
AD3
AD4
AD5
AD8
AD9
AD10
AD11
AD6
AD7
AD12
AD13
AD14
AD15
P1-5 SYST RESET
-WDIS (S3-1)
-WDPIS (S4-1)
X7 74367 LS
X12 74367 LS
X11 74367 LS
+5V
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
S2
+5
X14
-RESET (X2-1)
S7
P1-27 IC2
P1-50 IC3
P1-49 IC4
P1-26 NRIS
P1-28 NARMS
P1-30 NTDS
X15 74367
+5

SIZE	PART NO.	REV.
C		

NEXT ASSY	USED ON	APPLICABLE SPECS	DRAWING CLASS	MATERIAL
APPLICATION		TOLERANCES UNLESS OTHERWISE INDICATED FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2	DR BY / DATE 7/12/77 CHKD BY DESIGN BY APPRVD BY	FINISH

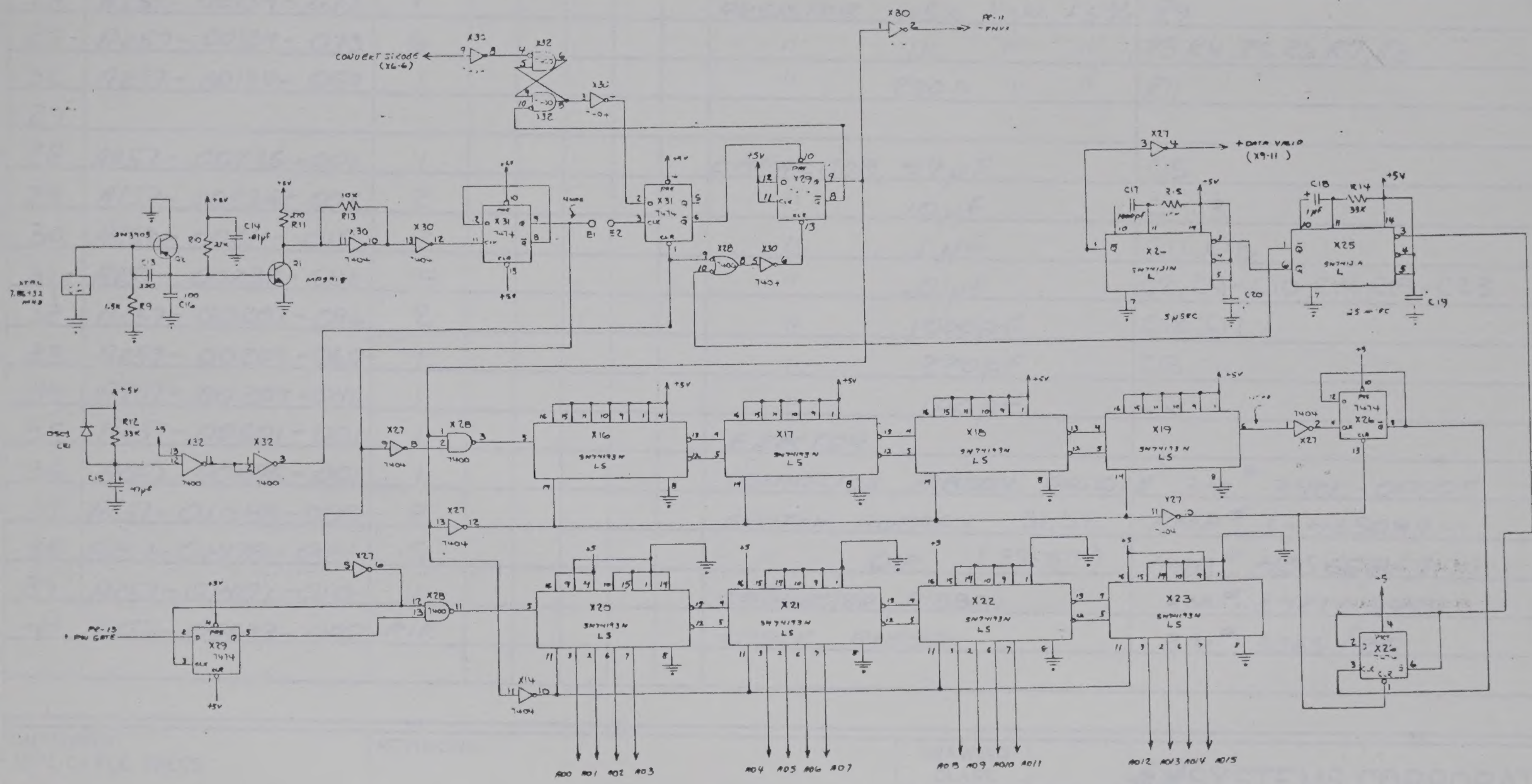
SYSTEMS CORPORATION

TITLE A/D CONTROLLER SCHEMATIC

SIZE	PART NO.	REV.
C	30209-03	B

SCALE

SHEET 2 OF 3


CONVERT STROBE (X6-6)
X32
X30
PF-11
-ENVL
XTAL 7.86432 MHZ
2N3905
Q2
R9 1.5K
C13 330
C16 100
R10 27K
C14 .01µF
R11 270
Q1
MPS918
R13 10K
X30 7404
X31 7474
X28
X29
E1
E2
+5V
+DATA VALID (X9-11)
X27
C17 1000pF
2.5
X24 SN74123N L
5µSEC
C20
C18 1µF
R14 39K
X25 SN74123 A L
C19
OSC CR1
R12 39K
C15 47µF
X32 7400
X27 7404
X28 7400
X16 SN74193N LS
X17 SN74193N LS
X18 SN74193N LS
X19 SN74193N LS
X26 7474
X27 7404
X20 SN74193N LS
X21 SN74193N LS
X22 SN74193N LS
X23 SN74193N LS
X14 7404
PF-13
+ PW GATE
X29 7474
AD0 AD1 AD2 AD3
AD4 AD5 AD6 AD7
AD8 AD9 AD10 AD11
AD12 AD13 AD14 AD15
-5

D 30109-03 1

A

SYSTEMS CORPORATION
TITLE [illegible]
SIZE D
PART NO 30209-03
REV B
SCALE
SHEET 3 OF 3

DRAWING CLASS
MATERIAL
FINISH
TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1°
NEXT ASSY
USED ON
APPLICATION

1

BILL OF MATERIAL

30209-01 B

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
21									
22	A257-00134-083	1						RESISTOR, 2.7K, 1/4W, ±5%	R10
23	A257-00012-001	2						IC MODULE 7404	X27, X30
24	A257-00134-077	1						RESISTOR, 1.5K, 1/4W, ±5%	R9
25	A257-00134-073	6						" 1K " "	R3, R4, R5, R6, R7, R8
26	A257-00134-059	1						" 270Ω " "	R11
27									
28	A257-00236-001	1						CAPACITOR, 47μf	C15
29	A257-00236-002	2						" 10μf	C1, C3
30	A257-00211-015	2						" 1μf	C11, C18
31	A257-00232-001	14						" .01μf	C2, C4-C10, C14, C19-C23
32	A257-00207-096	2						" 1000pf	C12, C17
33	A257-00207-060	1						" 220pf	C13
34	A257-00207-046	1						" 100pf	C16
35	A257-00601-001	1						EJECTOR	
36	A257-00476-001	1						CONNECTOR, RIBBON, PADDLE	3M # 3422-0000T
37	A257-01449-005	2						SWITCH, ROTARY S1, S2	AMP # 1-435097-1
38	A257-01478-004	5						" , DIP (S3·S7)	AMP # 435668-3
39	A257-01407-010	1						CONNECTOR, RIBBON	3M # 3421-3000
40	A257-00693-050	A/R						CABLE, RIBBON	3M # 3365/20

CUSTOMER
APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR-BY

DATE 2/2/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30209-01

REV. B

SHEET 2 OF 2

BRUNING 40-21 23352

BILL OF MATERIAL

30209-01 B

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30209-01	1						A/D CONTROLLER PC CARD ASS'Y	
1	30209-02B	1						PC CARD, ETCHED & DRILLED	
2	30209-03	REF						SCHEMATIC	
3	A257-00012-004	2						IC MODULE 7400	X28, X32
4	A257-01046-004	1						" " 74LS04	X14,
5	A257-00013-005	3						7474	X26, X29, X31
6	A257-01046-038	1						IC MODULE 74LS38	X10
7	A257-01046-074	1						" " 74LS74	X9,
8	A257-01052-121	4						" " 74L121	X1, X6, X24, X25
9	A257-01046-138	3						" " 74LS138	X5, X8, X13
10	A257-01046-174	1						" " 74LS174	X2
11	A257-01046-193	8						" " 74LS193	X16-X23
12	A257-01046-367	5						" " 74LS367	X3, X4, X7, X11, X12
13	A257-00012-367	1						" " 74367	X15
14	A257-00095-002	1						TRANSISTOR, MPS918	Q1
15	A257-00095-001	1						" 2N3905	Q2
16	A257-00000-001	1						DIODE, D501	CR1
17	A257-00303-004	1						XTAL, 7.86432 MHZ	Y1
18	A257-00135-010	2						RESISTOR, 33K, 1/4W ± 5%	R12, R14
19	A257-00135-001	2						" 13K " "	R1, R2
20	A257-00134-097	2						" 10K " "	R13, R15

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 2/2/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30209-01

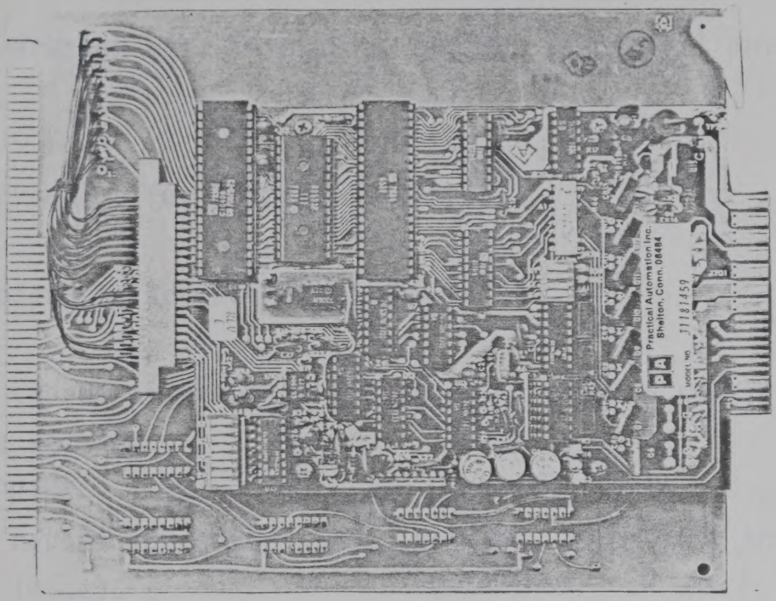
REV. B

SHEET 1 OF 2

FX
BF INSTRUMENTS
SYSTEMS CORPORATION

PRODUCT DATA

MODEL 30221 PRINTER INTERFACE



The 30221 is a standard module of the 27000 Series chassis which incorporates an internal printer. The Model 30221 is designed for insertion only in the extreme left hand front slot of the chassis.

The Model 30221 interfaces a full ASCII dot matrix strip printer to the 8080 bus. The required companion assemblies are as follows (reference assembly 30220):

FXS PART NO.	PRACTICAL AUTOMATION PART NO.
1. A257-00541-001	100 T PRINT HEAD
2. A257-00541-005	6-28 POWER SUPPLY
3. A257-00541-006	C11-80153 CABLE ASSEMBLY
4. A257-00541-004	UP7-1 MICROPROCESSOR CONTROLLER

Item one is a mechanical device mounted immediately to the right of the Model 30221. Item two is mounted in the right rear of the chassis. Item 4 is physically mounted on the Model 30221. Item 3 connects the other items.

Schematic 30221-03 sheet 1 of 2 shows the output word circuitry. Note that this card has a fixed address with the first word bits supplying the character to be printed, and the load strobe, and the second word bits supplying the control

MODEL 30221 PRINTER INTERFACE (continued)

signals. The strobe and all control signals are to be 25 microseconds minimum in duration.

STROBE

Loads character bits into print buffer. (Line will print if buffer filled).

PRINT

Causes print buffer to print a line.

FEED

Causes paper to advance one line.

ENHANCE

(level) causes printing of a diagnostic pattern continuously until level is removed.

INVERT PRINT

(level) causes characters, when printed, to be left to right reversed. (mirror image).

10 FEED

(Pulse) causes paper to advance one line.
(level) causes paper to advance continuously.

Schematic 30221-03 sheet 2 of 3 shows the interrupt structure. Note that the interrupt bit is fixed, but that the card may be assigned to one of three interrupt levels with Switch 1.

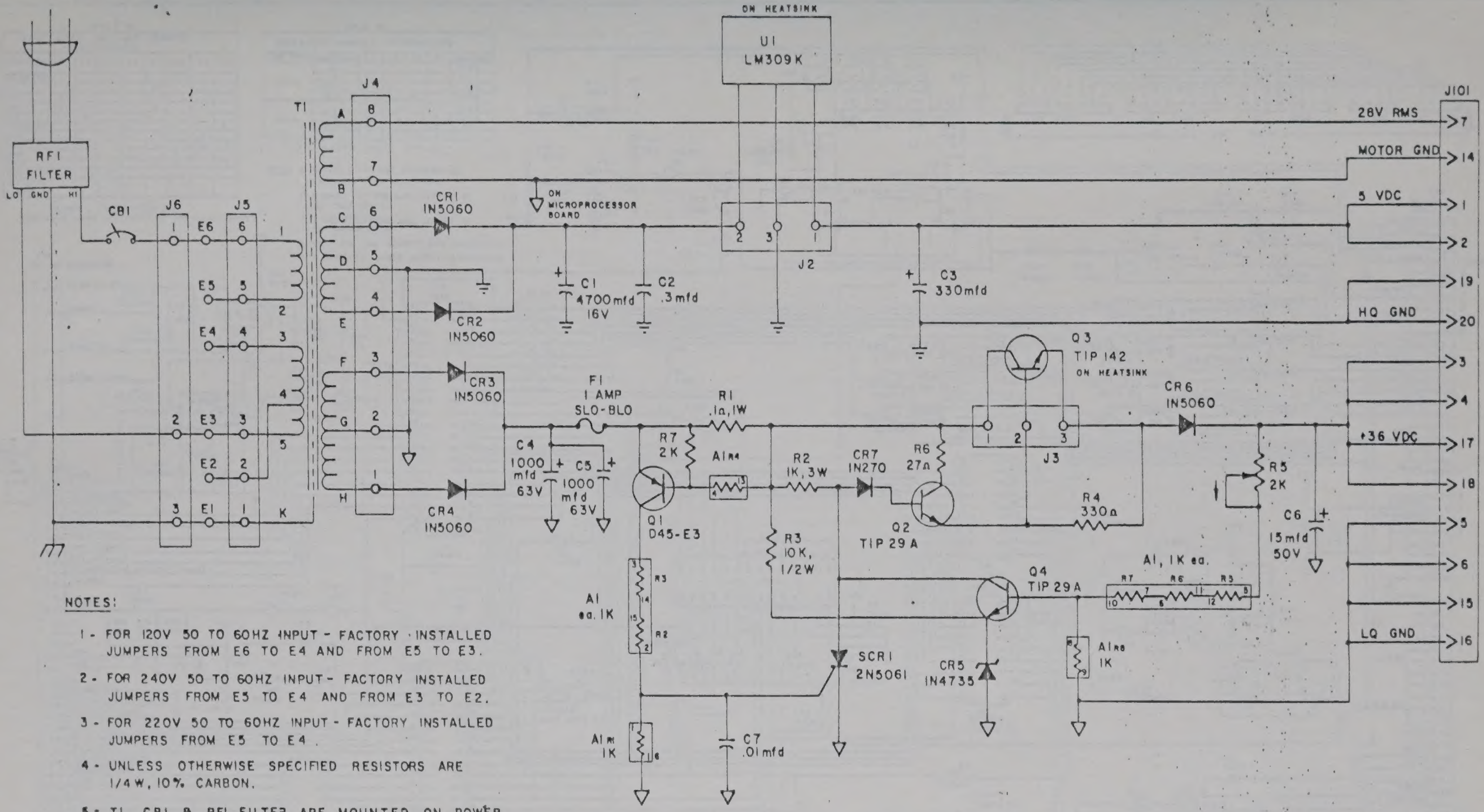
LEVEL	SWITCH 1 CLOSED
2	1,4
3	3,5
4	2,6

Interrupts occur when the printer acknowledges that it has completed the commanded operation, and is ready to accept another command. A delay (V12) has been added to insure against race conditions.

7 BIT ASCII CODE

Octal Code	Char	Octal Code	Char	Octal Code	Char	Octal Code	Char
		040	SP	100	@		
001	SOH	041	!	101	A		
		042	"	102	B		
		043	#	103	C		
		044	$	104	D		
		054	%	105	E		
		046	&	106	F		
		047	'	107	G		
		050	(	110	H		
		051	)	111	I		
012	LF	052	*	112	J		
		053	+	113	K		
		054	'	114	L		
015	CR	055	.	115	M		
		056	.	116	N		
		057	/	117	O		
		060	0	120	P		
		061	1	121	Q		
		062	2	122	R		
		063	3	123	S		
		056	4	124	T		
		065	5	125	U		
		066	6	126	V		
		067	7	127	W		
		070	8	130	X		
		071	9	131	Y		
		072	:	132	Z		
		073	;	133	[		
		074	<	134			
		075	=	135	] or ↑		
		076	>	136	Λ		
		077	?	137	– or ←		

Printer ASCII Character Set


ON HEATSINK
U1
LM309K
J101
28V RMS
MOTOR GND
5 VDC
HQ GND
+36 VDC
LQ GND
>7
>14
>1
>2
>19
>20
>3
>4
>17
>18
>5
>6
>15
>16
RFI FILTER
LO GND HI
CB1
J6
J5
J4
T1
E6
E5
E4
E3
E2
E1
A
B
C
D
E
F
G
H
K
CR1 1N5060
CR2 1N5060
CR3 1N5060
CR4 1N5060
ON MICROPROCESSOR BOARD
C1 4700mfd 16V
C2 .3mfd
J2
C3 330mfd
Q3 TIP 142 ON HEATSINK
CR6 1N5060
F1 1 AMP SLO-BLO
R1 .1Ω, 1W
C4 1000 mfd 63V
C5 1000 mfd 63V
R7 2K
A1R4
R2 1K, 3W
CR7 1N270
R6 27Ω
J3
R4 330Ω
R5 2K
C6 15mfd 50V
Q1 D45-E3
Q2 TIP 29 A
R3 10K, 1/2W
Q4 TIP 29A
A1, 1K ea.
R7
R6
R3
A1 ea. 1K
R3
R2
A1R8 1K
SCR1 2N5061
CR5 1N4735
A1R1 1K
C7 .01mfd

NOTES:

1 - FOR 120V 50 TO 60HZ INPUT - FACTORY INSTALLED JUMPERS FROM E6 TO E4 AND FROM E5 TO E3.

2 - FOR 240V 50 TO 60HZ INPUT - FACTORY INSTALLED JUMPERS FROM E5 TO E4 AND FROM E3 TO E2.

3 - FOR 220V 50 TO 60HZ INPUT - FACTORY INSTALLED JUMPERS FROM E5 TO E4.

4 - UNLESS OTHERWISE SPECIFIED RESISTORS ARE 1/4W, 10% CARBON.

5 - T1, CB1 & RFI FILTER ARE MOUNTED ON POWER SUPPLY BASE.

LAST DESIGNATIONS							
R7	A1	C7	J6	CR7	SCR1	Q4	F1
MISSING DESIGNATIONS							
J1							

DRAWN BY AJT
DATE 1-11-77
CHKD BY
DATE 1/11/77
APPD BY
DATE 1-11-77

PRACTICAL AUTOMATION, INC.
SHELTON, CONN.

PS6-28
POWER SUPPLY SCHEMATIC

MATERIAL
FINISH
SHEET 1 of 1
SCALE
C11-80137

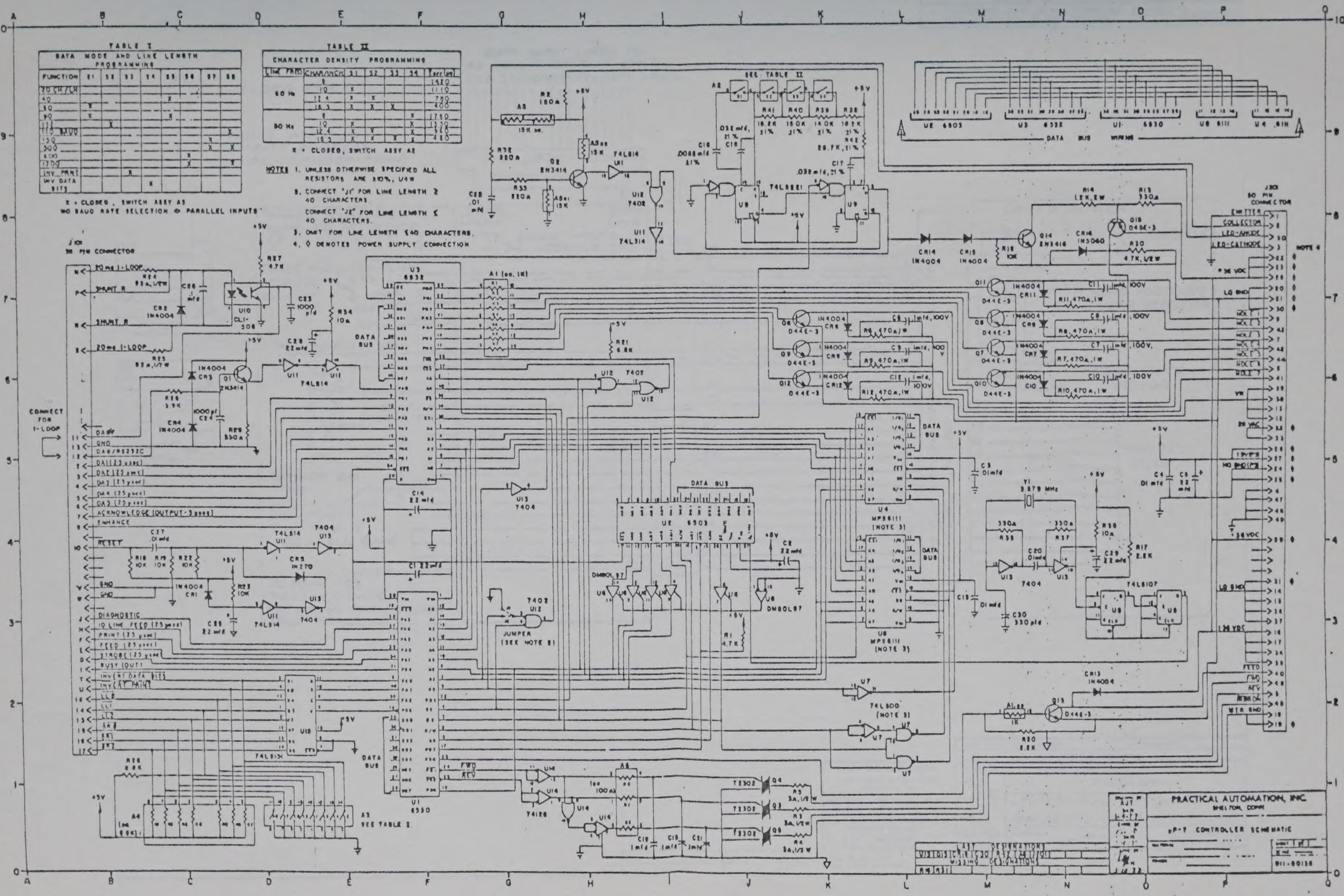

J101
36 PIN CONNECTOR
CONNECT FOR I-LOOP
J301
50 PIN CONNECTOR
DATA BUS WIRING
U6 6503
U3 6532
U1 6530
U8 6111
U4 6111
U4 MPS6111 (NOTE 3)
U8 MPS6111 (NOTE 3)
JUMPER (SEE NOTE 2)
A3 SEE TABLE I
SEE TABLE II
Y1 3.579 MHz
EMITTER
COLLECTOR
LED-ANODE
LED-CATHODE
+5V
+24 VDC
NOTE 4
PRACTICAL AUTOMATION, INC.
SHELTON, CONN
µP-7 CONTROLLER SCHEMATIC
011-00138

TABLE I

DATA MODE AND LINE LENGTH PROGRAMMING								
FUNCTION	S1	S2	S3	S4	S5	S6	S7	S8
20 CH/CR								
40					X			
80	X							
90	X				X			
134		X						
110 BAUD								X
150							X	
300							X	X
600						X		
1200						X		X
INV PRNT			X					
INV DATA BITS				X				

X = CLOSED, SWITCH ASSY A3
NO BAUD RATE SELECTION @ PARALLEL INPUTS

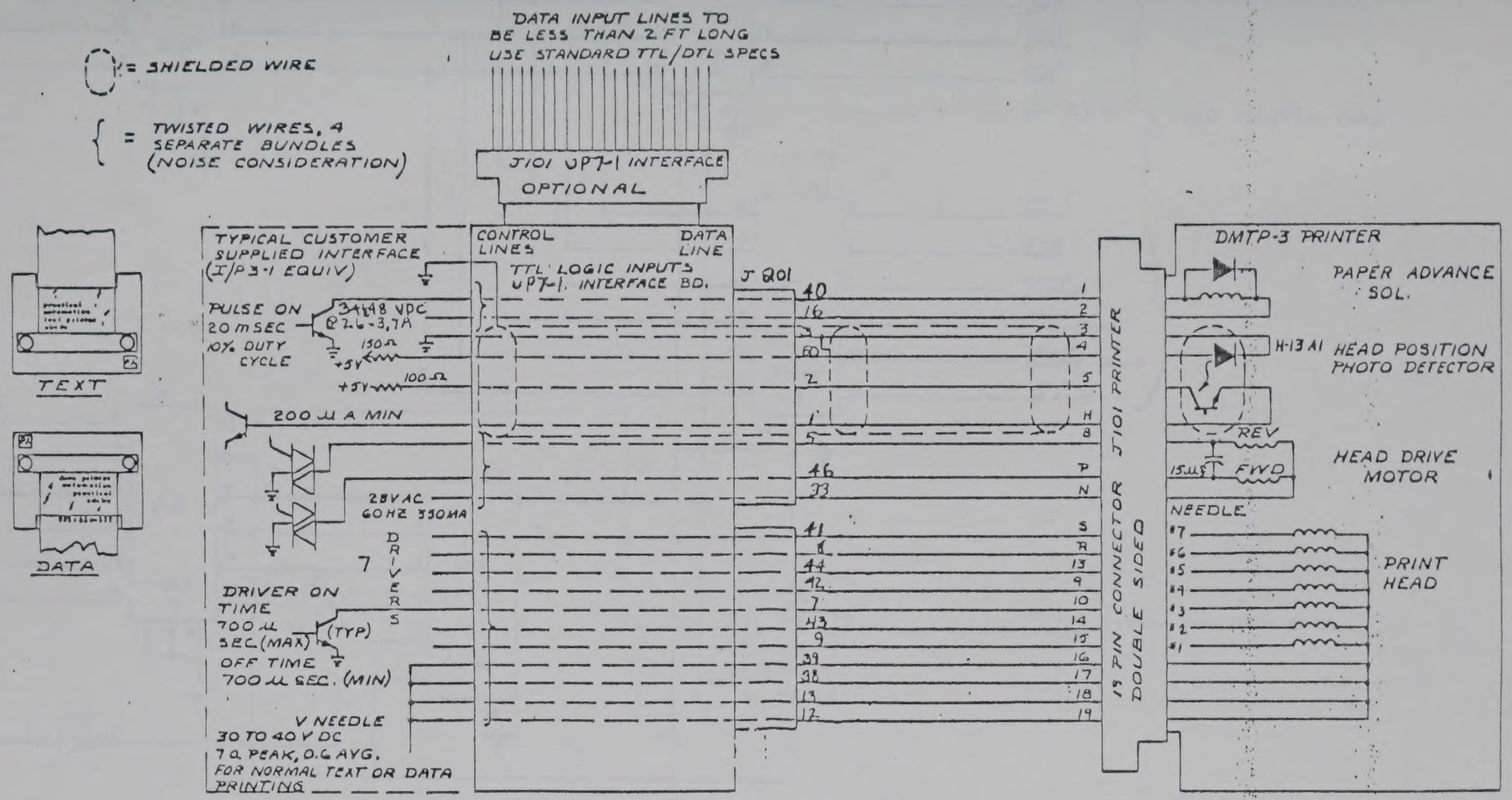
TABLE II

CHARACTER DENSITY PROGRAMMING						
LINE FREQ	CHAR/INCH	S1	S2	S3	S4	Tref (µs)
60 Hz	8					1420
	10	X				1110
	12.4	X	X			780
	16.5	X	X	X		400
50 Hz	8				X	1790
	10	X			X	1330
	12.4	X	X		X	960
	16.5	X	X	X	X	480

X = CLOSED, SWITCH ASSY A2

NOTES
1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE ±10%, 1/4W
2. CONNECT "J1" FOR LINE LENGTH ≥ 40 CHARACTERS.
CONNECT "J2" FOR LINE LENGTH ≤ 40 CHARACTERS.
3. OMIT FOR LINE LENGTH ≤40 CHARACTERS.
4. ◊ DENOTES POWER SUPPLY CONNECTION

REVISIONS			
SYM	DESCRIPTION	DATE	APPR
A	700 US WAS 650 20 m SEC WAS 30 44-48 V @ 2 AMP WAS 36 V@ 1.5 AMP	9-16-76	



( ) = SHIELDED WIRE
{ = TWISTED WIRES, 4 SEPARATE BUNDLES (NOISE CONSIDERATION)
DATA INPUT LINES TO BE LESS THAN 2 FT LONG USE STANDARD TTL/DTL SPECS
J101 UP7-1 INTERFACE
OPTIONAL
TEXT
DATA
TYPICAL CUSTOMER SUPPLIED INTERFACE (I/P3-1 EQUIV)
PULSE ON 20 m SEC 10% DUTY CYCLE
34-48 VDC @ 2.6-3.7A
150Ω
+5V
100Ω
+5V
200 µ A MIN
28VAC 60HZ 350MA
7 DRIVERS
DRIVER ON TIME 700 µ SEC (MAX)
(TYP)
OFF TIME 700 µ SEC. (MIN)
V NEEDLE 30 TO 40 V DC 7 a PEAK, 0.6 AVG. FOR NORMAL TEXT OR DATA PRINTING
CONTROL LINES
DATA LINE
TTL LOGIC INPUTS UP7-1 INTERFACE BD.
J 801
40
16
60
2
1
5
46
33
41
8
44
42
7
43
9
39
38
13
12
1
2
3
4
5
H
8
P
N
S
R
13
9
10
14
15
16
17
18
19
19 PIN CONNECTOR J101 PRINTER DOUBLE SIDED
DMTP-3 PRINTER
PAPER ADVANCE SOL.
H-13 A1 HEAD POSITION PHOTO DETECTOR
REV
FWD
15µF
HEAD DRIVE MOTOR
NEEDLE
#7
#6
#5
#4
#3
#2
#1
PRINT HEAD

QTY	ITEM	PART NUMBER	NOMENCLATURE
LIST OF MATERIALS			

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS ± 1/64 DECIMALS ±.0 ANGLES ± 1°
( ) RMS MICRO INCH ON ALL MACHINED SURFACES
( ) T.I.R. CONCENTRICITY FOR ALL DIAMETERS
REMOVE ALL BURRS AND SHARP CORNERS

USED ON
NEXT ASS'Y

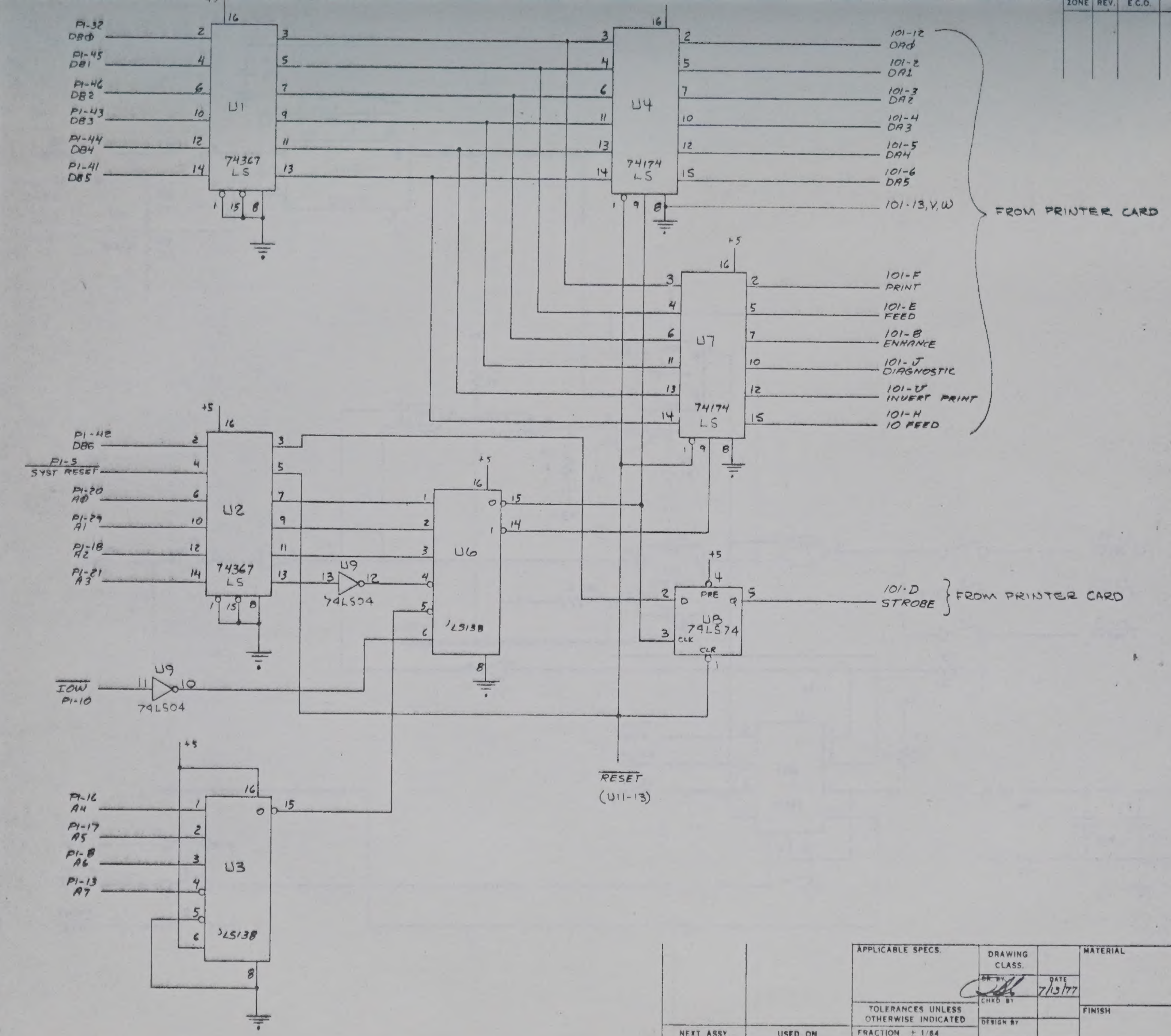
DRAWN BY
DATE 10-13-75
CHKD BY
DATE

PRACTICAL AUTOMATION, INC.
SHELTON, CONN.

UP7-1 OR EQUIV. TO DMTP 3
HARNESS & INTERFACE REQMTS.

MATERIAL
FINISH
SHEET 1 OF 1
SCALE

ZONE	REV.	E.C.O.	DESCRIPTION	DRFT.	DATE	APPVD



P1-32 DB0
P1-45 DB1
P1-46 DB2
P1-43 DB3
P1-44 DB4
P1-41 DB5
U1
74367 LS
U4
74174 LS
101-12 DA0
101-2 DA1
101-3 DA2
101-4 DA3
101-5 DA4
101-6 DA5
101-13,V,W
FROM PRINTER CARD
+5
U7
74174 LS
101-F PRINT
101-E FEED
101-B ENHANCE
101-J DIAGNOSTIC
101-U INVERT PRINT
101-H 10 FEED
P1-42 DB6
P1-5 SYST RESET
P1-20 A0
P1-29 A1
P1-18 A2
P1-21 A3
U2
74367 LS
U9
74LS04
U6
'LS138
U8
74LS74
PRE
D
Q
CLK
CLR
101-D STROBE
FROM PRINTER CARD
IOW P1-10
U9
74LS04
RESET (U11-13)
P1-16 A4
P1-17 A5
P1-8 A6
P1-13 A7
U3
'LS138

SIZE C | PART NO. | REV.

APPLICABLE SPECS.

DRAWING CLASS.

DR BY [illegible] DATE 7/13/77

CHKD BY

DESIGN BY

APPRVD BY

MATERIAL

FINISH

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°

NEXT ASSY. | USED ON
APPLICATION

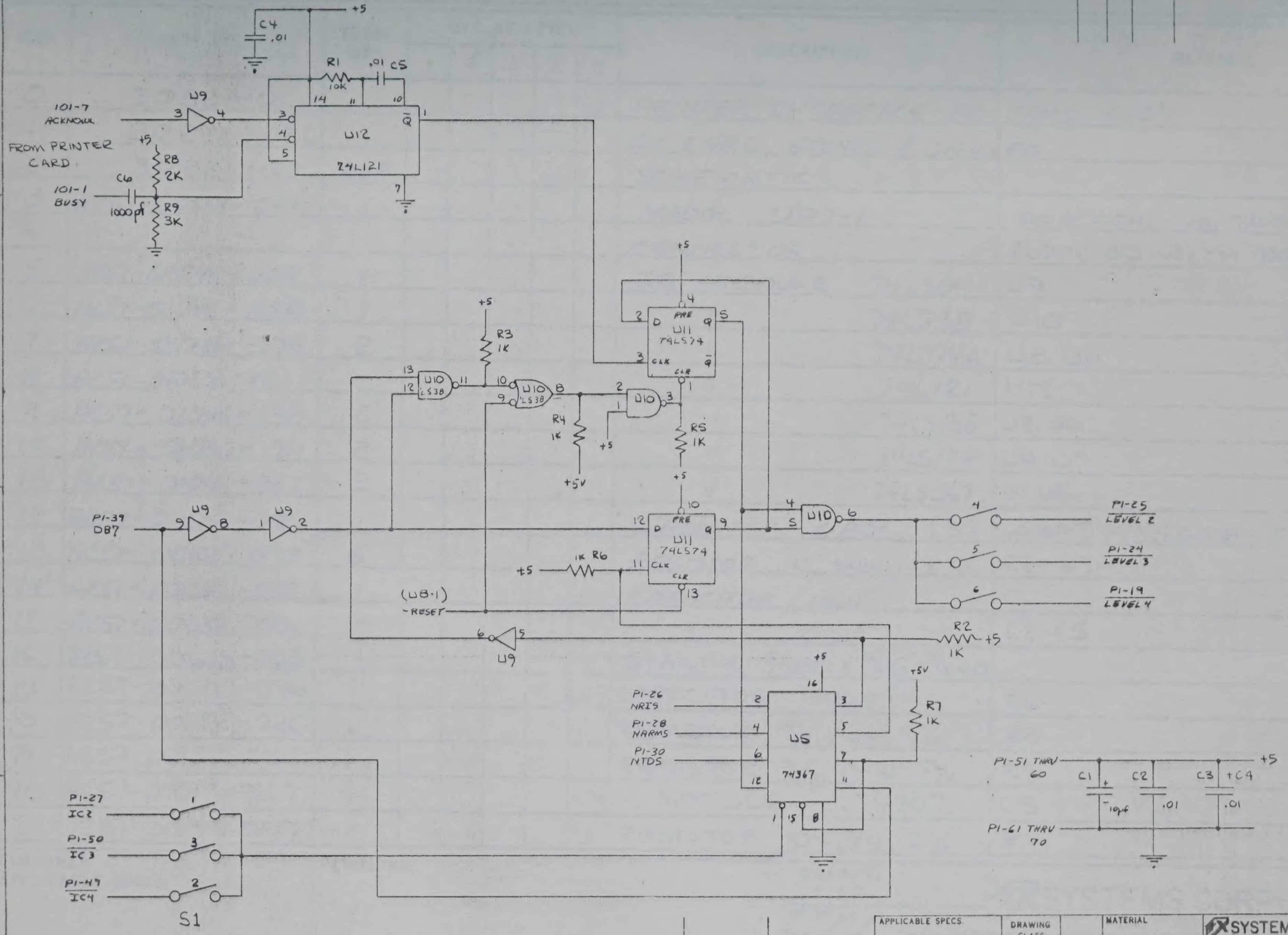
SYSTEMS CORPORATION

TITLE SCHEMATIC
PRINTER INTERFACE

SIZE C PART NO. 30221-03 REV. B

SCALE SHEET 1 OF 2

BRUNING 40-21 23352-2


C4
.01
+5
R1
10K
.01 C5
14
11
10
U9
3
4
101-7
ACKNOWL
FROM PRINTER
CARD
3
4
5
U12
74L121
Q̄
1
7
+5
R8
2K
C6
101-1
BUSY
1000pf
R9
3K
+5
R3
1K
+5
4
PRE
D
2
U11
74LS74
Q
5
CLK
3
Q̄
CLR
1
13
12
U10
'LS38
11
10
9
U10
'LS38
8
2
1
U10
3
R4
1K
+5V
+5
R5
1K
+5
10
PRE
12
D
U11
74LS74
Q
9
+5
1K R6
11
CLK
CLR
13
4
5
U10
6
P1-39
DB7
U9
9
8
U9
1
2
(U8-1)
-RESET
6
U9
5
R2
1K
+5
4
5
6
P1-25
LEVEL 2
P1-24
LEVEL 3
P1-19
LEVEL 4
+5
16
P1-26
NRIS
2
P1-28
NARMS
4
P1-30
NTDS
6
12
U5
74367
3
5
7
11
1
15
8
+5V
R7
1K
P1-51 THRU
60
C1
+
-
10μf
C2
.01
C3
+C4
.01
+5
P1-61 THRU
70
P1-27
IC2
1
P1-50
IC3
3
P1-47
IC4
2
S1

SIZE C
PART NO.
REV.

APPLICABLE SPECS.

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°

DRAWING CLASS
DR BY
DATE 7/13/77
CHKD BY
DESIGN BY
APPRVD BY

MATERIAL
FINISH

NEXT ASSY.
USED ON
APPLICATION

SYSTEMS CORPORATION
TITLE SCHEMATIC
PRINTER INTERFACE
SIZE C
PART NO. 30221-03
REV. B
SCALE
SHEET 2 OF 2

BRUNING 40-21 23352-2

BILL OF MATERIAL	30221-01	C

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30221-01	1						PRINTER INTERFACE PC CARD ASS'Y	
1	30221-02C	1						PC CARD, ETCHED & DRILLED	
2	30221-03	REF						SCHEMATIC	
3	A257-00541-004	1						MODEL UP7-1	PRACTICAL AUTOMATION
4								CONNECTOR	SUPPLIED WITH BOARD
5	A257-01046-004	1						IC MODULE 74LS04	U9
6	A257-01046-038	1						" 74LS38	U10
7	A257-01046-074	2						" 74LS74A	U8, U11
8	A257-01052-121	1						" 74L121	U12
9	A257-01046-138	2						" 74LS138	U3, U6
10	A257-01046-174	2						" 74LS174	U4, U7
11	A257-01046-367	2						" 74LS367	U1, U2,
12	A257-01478-006	1						DIPSWITCH 6 POS (S1)	AMP # 435668-5
13	A257-00134-073	6						RESISTOR, 1K, 1/4W, ±5%	R2-R7
14	A257-00236-002	1						CAPACITOR, 10µf	C1
15	A257-00232-001	4						" .01µf	C2-C5
16	B257-00605-003	4						SPACER 3/16 HEX × 1/4 LG × #4-40	
17	A257-00207-096	1						CAPACITOR 1000pf	C6
18	A257-00134-080	1						RESISTOR 2K, 1/4W, 5%	R8
19	A257-00134-084	1						RESISTOR 3K, 1/4W, 5%	R9
20	A257-00012-367	1						IC MODULE 74367	U5
21	A257-00134-097	1						RESISTOR 10K, 1/4, 5%	R1

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.	
DR. BY	DATE 7/21/77
CHKD. BY	
APPRVD. BY	

SYSTEMS CORPORATION

DWG. NO. 30221-01

REV. C

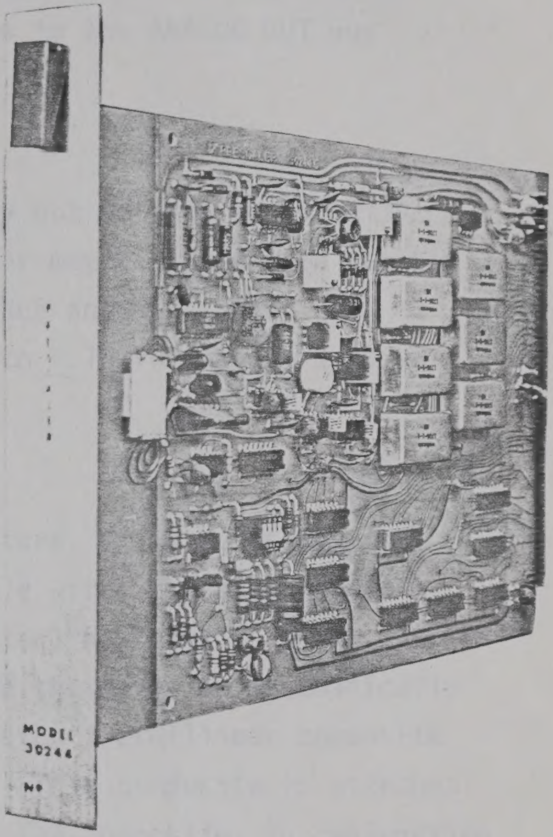
SHEET 1 OF 1

BRUNING 40-21 23352

INSTRUMENTS
SYSTEMS CORPORATION

PRODUCT DATA

PRESCALER - MODULE 30244 (30244-01, 30244-11)



The 30244 is a standard module of the 27000 Series chassis. The Model 30244-01 is designed for use in a rear facing slot. The Model 30244-11 is generally used in one of the front facing slots.

The 30244 is a multi-function analog subsystems card and contains:

1. The hardware universal TC reference junction circuitry.
2. The analog bypass relay.
3. A high voltage attenuator.
4. The contact status circuitry.
5. The battery charger.
6. The power monitor and reset circuit.

Schematic 30244-03 sheet 1 of 4 shows the CPU interface circuitry. Note that this card has a fixed address. A control word may be written to the card, or the contact status read from the card.

Schematic 30244-03 sheet 2 of 4 shows the hardware universal TC reference junction, the analog bypass relay, and the high voltage attenuator.

BYPASS (bit 2)

The multi-bus architecture is designed such that analog inputs, such as from multiplexers, may be applied to switched (time-shared) signal conditioners which perform analog manipulations upon the signal to produce a processed analog output. Consequently, analog inputs are switched to the ANALOG IN bus (P1-79 thru 84). The AID converter processes DC analog signals appearing on the ANALOG OUT bus (P1-73 thru 78). In the event that a particular input re-

PRESCALER (continued)

quires no conditioning, it may be switched directly to the AID input by the bypass relay RL2, which connects the ANALOG IN bus to the ANALOG OUT bus when operated.

ATTENUATOR (bit 3)

Differential DC voltages greater than +1 - 15V may not be applied directly to the A/D converter. A fixed 10:1 voltage divider may be interposed between the analog input and the A/D by operating relays RL5 and RL6. When the attenuator is selected, differential voltages up to ± 150VDC may be applied to the analog input.

COMPENSATION (bit 1) and THERMISTOR (bit 0)

In order to use a thermocouple to measure temperature, it is necessary that the temperature of the point where the thermocouple wires are attached to the copper circuitry of the unit (reference junction) be known. To this end TC's are connected to terminals which are imbedded thermally and mechanically in an isothermal block (30294) mux card. A precision thermilinear composite network is also imbedded in the isothermal block. This composite is attached to the COMP BUS (P1-91 thru 96) by the mux card. The composite, in conjunction with a resistor network and a high precision voltage source generates an extremely stable ovenized reference voltage, and in conjunction with X12 forms the precision voltage source. Note that if both the THERMISTOR and COMPENSATION bits are true, then relays RL1 and RL3 are operated. Buffer X11 places the precision temperature analog voltage on the ANALOG OUT bus (P1-73 thru 78) for conversion by the AID.

The accuracy of this measurement depends on the voltage transfer through the buffer X11. Since slight variations of this transfer can be expected when the ambient temperature of the circuitry changes, automatic correction software has been provided. This involves bringing the COMPENSATION bit high while the THERMISTOR bit remains low. Thus RL3 is operated alone, and the precision voltage source can be measured unloaded. The software uses the

COMPENSATION (continued)

value of this reading to compute a correction factor which is then applied to the temperature analog voltage.

Schematic 30244-03 sheet 3 of 4 shows the contact status circuitry. X16 and Q1 form a 1 mA constant current source. When the CONTACT bit operates RL4 the voltage applied to comparator X15 depends on the resistance between the (+) and (-) lines of the ANALOG INPUT bus. The OPEN/CLOSED decision point is approximately 1.5Kµ. The status of the comparator is made available to the CPU through optoisolator X14.

Schematic 30244-03 sheet 4 of 4 shows the battery charger, power monitor and system reset circuitry. The circuitry as shown will handle (1) Model 30205, 2K CMOS RAM card. For each additional Model 30205 card added to the system, one switch section S1 must be closed. A total of five (5) Model 30205 cards may be used in a system.

WORD	IN 1

ASS'Y	30244

ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
	10																

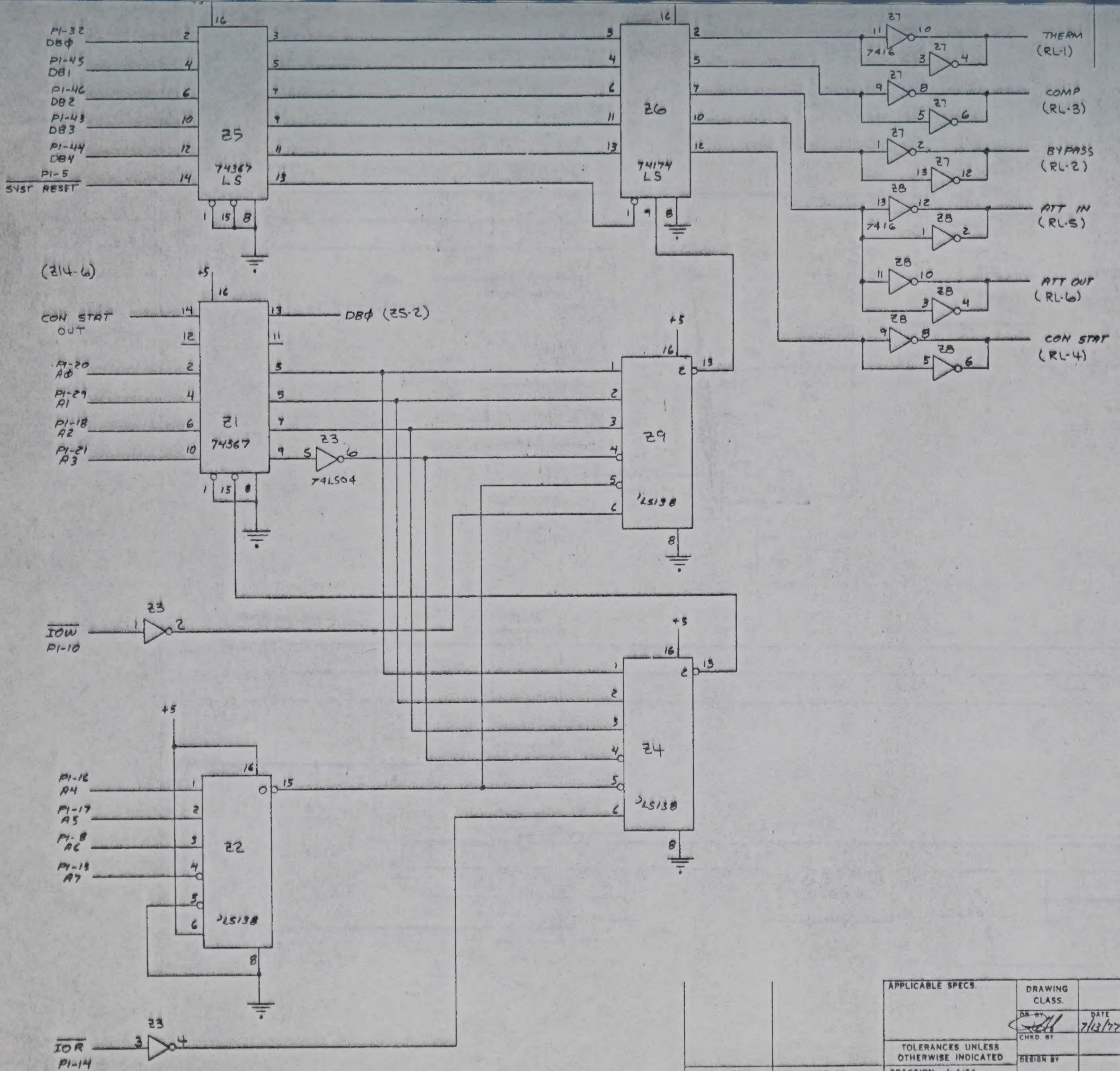
BIT	IDENTIFY	"1" CONDITION
BD 00	CON STAT	OPEN/CLOSED
BD 01		
BD 02		
BD 03		
BD 04		
BD 05		
BD 06		
BD 07		
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		

WORD	OUT 1

ASS'Y	30244

ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
	10																

BIT	IDENTIFY	"1" CONDITION
BD 00	THERMISTOR	ON
BD 01	COMP	
BD 02	BYPASS	
BD 03	ATT IN	
BD 04	ATT OUT	
BD 05	CON STAT	
BD 06		
BD 07		
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		


P1-32 DBϕ
P1-45 DB1
P1-46 DB2
P1-43 DB3
P1-44 DB4
P1-5 SYST RESET
Z5
74367 LS
Z6
74174 LS
(Z14-6)
CON STAT OUT
DBϕ (Z5-2)
P1-20 Aϕ
P1-29 A1
P1-18 A2
P1-21 A3
Z1
74367
Z3
74LS04
Z9
'LS138
Z4
'LS138
Z2
'LS138
+5
IOW P1-10
IOR P1-14
P1-16 A4
P1-17 A5
P1-8 A6
P1-13 A7
Z7
Z8
7416
THERM (RL-1)
COMP (RL-3)
BYPASS (RL-2)
ATT IN (RL-5)
ATT OUT (RL-6)
CON STAT (RL-4)

SIZE	PART NO.	REV.
C		

APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
	DR BY	DATE 7/13/77	
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DESIGN BY APPRVD BY		

NEXT ASSY	USED ON
APPLICATION	

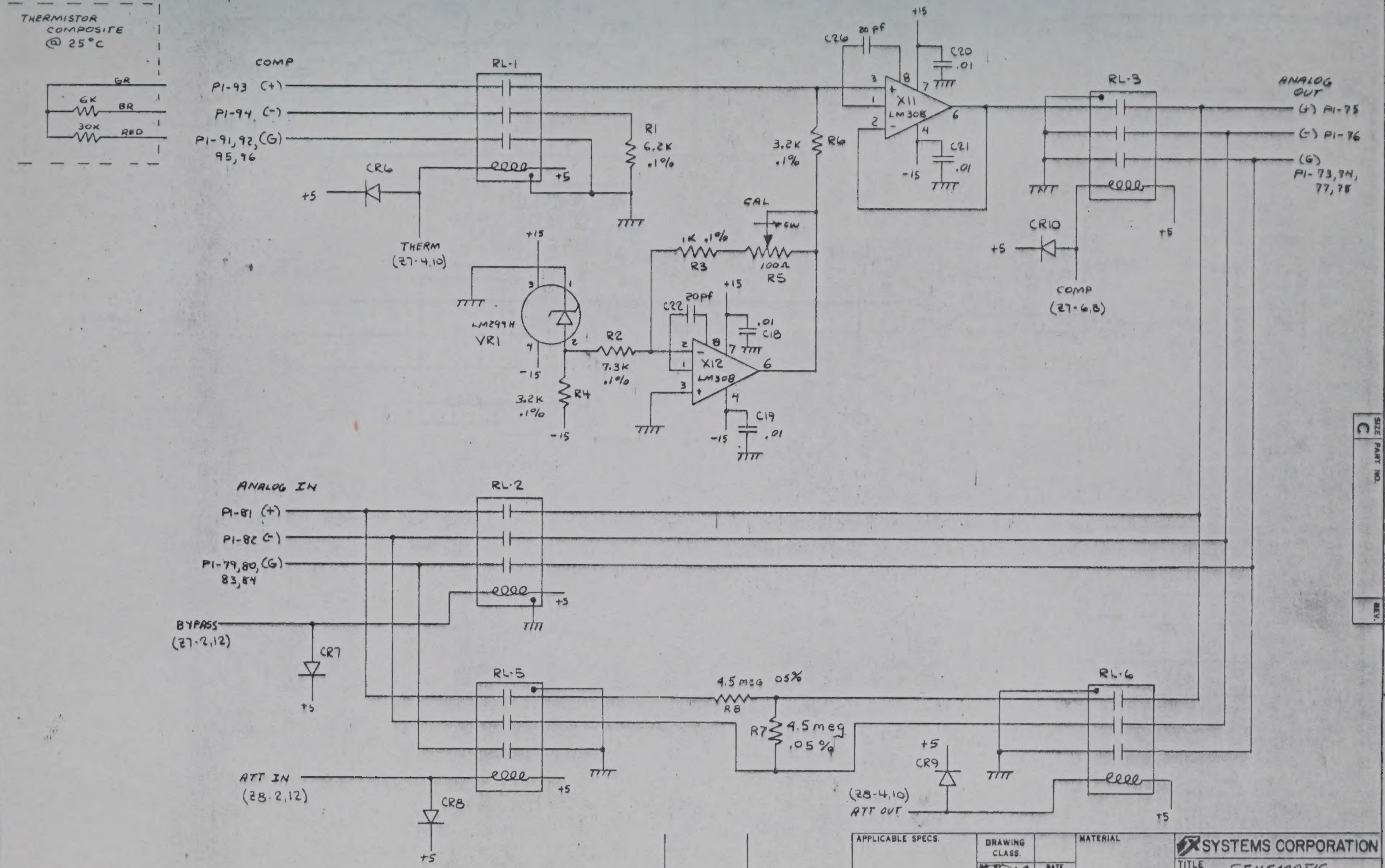
FX SYSTEMS CORPORATION

TITLE PRE SCALER SCHEMATIC

SIZE	PART NO.	REV.
C	30244-03	C

SCALE SHEET 1 OF 4

BRUNING 40-21 23352-2


THERMISTOR COMPOSITE @ 25°C
GR
6K
BR
30K
RED
COMP
P1-93 (+)
P1-94 (-)
P1-91, 92, (G) 95, 96
RL-1
CR6
+5
+5
THERM (27-4,10)
R1 6.2K .1%
+15
LM299H VR1
-15
R4 3.2K .1%
-15
R2 7.3K .1%
CAL
CW
R3 1K .1%
R5 100Ω
C22 20pf
+15
C18 .01
X12 LM308
C19 .01
-15
R6 3.2K .1%
C26 20pf
+15
C20 .01
X11 LM308
C21 .01
-15
RL-3
CR10
+5
COMP (27-6,8)
+5
ANALOG OUT
(+) P1-75
(-) P1-76
(G) P1-73, 74, 77, 78
ANALOG IN
P1-81 (+)
P1-82 (-)
P1-79, 80, (G) 83, 84
RL-2
+5
BYPASS (27-2,12)
CR7
+5
RL-5
+5
ATT IN (28-2,12)
CR8
+5
R8 4.5 meg .05%
R7 4.5 meg .05%
+5
CR9
(28-4,10) ATT OUT
RL-6
+5
D
C
B
A

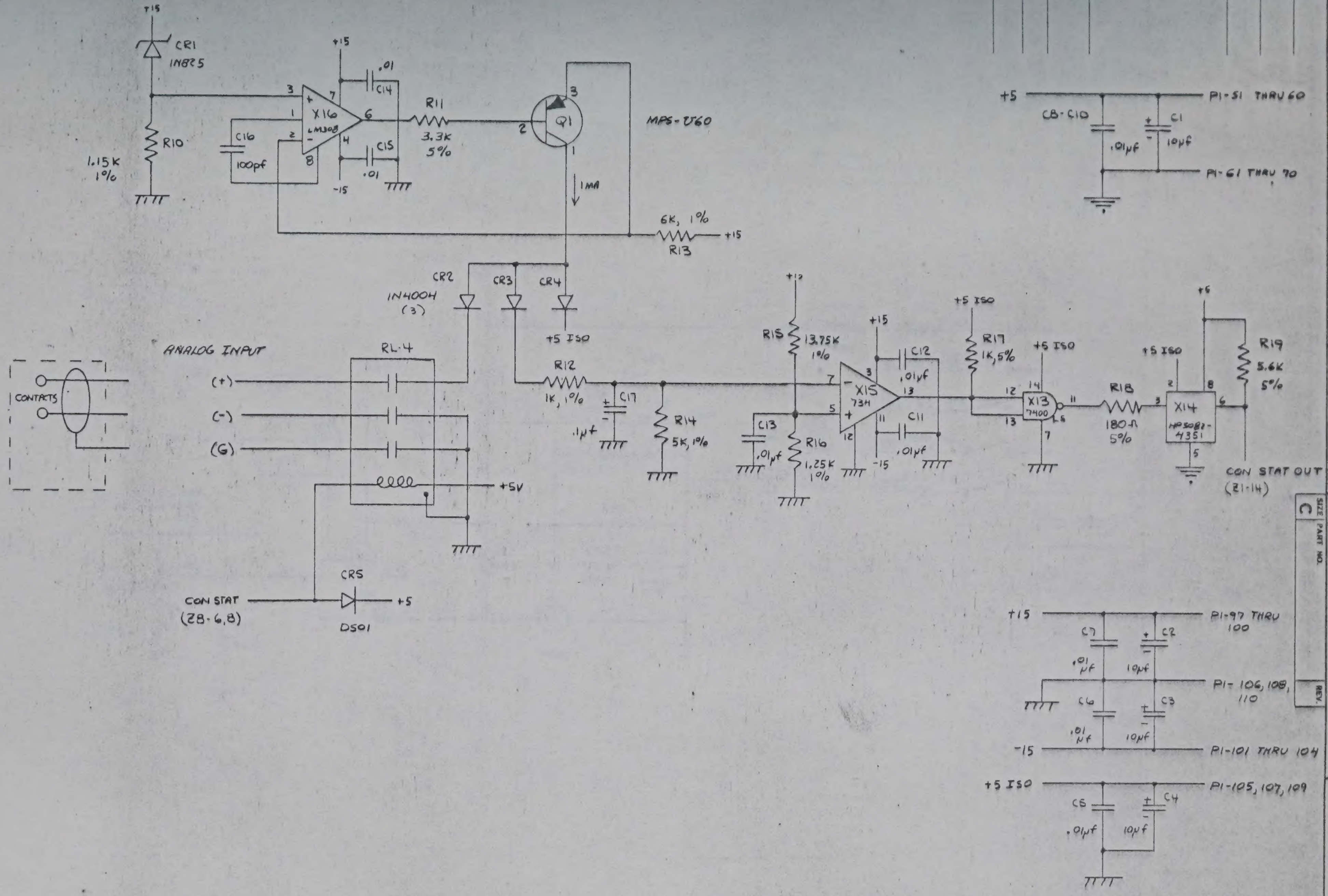
SIZE C PART NO. REV.

APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
	DR BY	DATE 12/4/77	
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DESIGN BY		
	APPRVD BY		

NEXT ASSY.	USED ON
APPLICATION	

SYSTEMS CORPORATION
TITLE SCHEMATIC PRESCALER
SIZE C PART NO. 30244-03 REV. C
SCALE SHEET 2 OF 4

BRUNING 40-21 23352

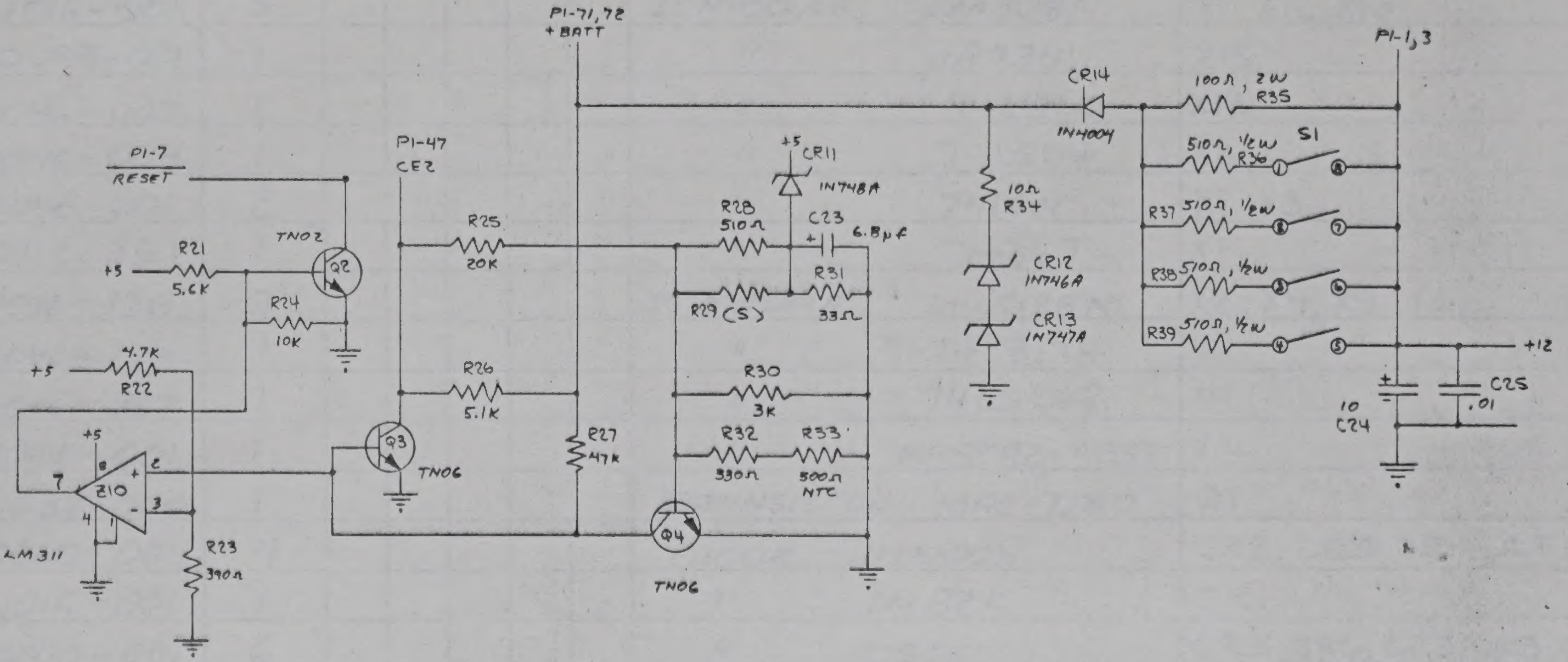

+15
CR1
1N825
R10
1.15K
1%
3
7
X16
LM308
6
1
2
4
8
C16
100pf
+15
.01
C14
C15
.01
-15
R11
3.3K
5%
2
Q1
3
1
MPS-U60
1MA
6K, 1%
R13
+15
CR2
CR3
CR4
1N4004
(3)
+5 ISO
CONTACTS
ANALOG INPUT
(+)
(-)
(G)
RL-4
+5V
R12
1K, 1%
C17
.1µf
R14
5K, 1%
CON STAT
(28-6,8)
CR5
DS01
+5
+12
R15
13.75K
1%
C13
.01µf
R16
1.25K
1%
+15
X15
734
C12
.01µf
C11
.01µf
-15
+5 ISO
R17
1K, 5%
X13
7400
R18
180Ω
5%
+5 ISO
X14
HP5082-4351
+6
R19
5.6K
5%
CON STAT OUT
(21-14)
+5
C8-C10
.01µf
C1
10µf
P1-51 THRU 60
P1-61 THRU 70
+15
C7
.01µf
C2
10µf
P1-97 THRU 100
P1-106, 108, 110
C6
.01µf
C3
10µf
-15
P1-101 THRU 104
+5 ISO
C5
.01µf
C4
10µf
P1-105, 107, 109
D
C
B
A

SIZE C PART NO. REV.

APPLICABLE SPECS.
DRAWING CLASS.
MATERIAL
DR BY
DATE 1/24/77
CHKD BY
TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°
DESIGN BY
APPRVD BY
FINISH
NEXT ASSY. USED ON
APPLICATION

SYSTEMS CORPORATION
TITLE SCHEMATIC
PRESCALER
SIZE C
PART NO. 30244-03
REV. C
SCALE
SHEET 3 OF 4

BRUNING 40-21 23352


P1-71,72
+BATT
P1-1,3
CR14
1N4004
100Ω, 2W
R35
510Ω, ½W
R36
S1
R37 510Ω, ½W
R38 510Ω, ½W
R39 510Ω, ½W
+12
C25
.01
10
C24
10Ω
R34
CR12
1N746A
CR13
1N747A
+5
CR11
1N748A
R28
510Ω
C23
6.8μf
R31
33Ω
R29 (S)
R30
3K
R32
330Ω
R33
500Ω
NTC
Q4
TN06
P1-47
CE2
R25
20K
R26
5.1K
R27
47K
Q3
TN06
P1-7
RESET
TN02
Q2
+5
R21
5.6K
R24
10K
+5
4.7K
R22
+5
7
8
Z10
2
3
4
1
LM311
R23
390Ω

NEXT ASSY.	USED ON
APPLICATION	

APPLICABLE SPECS

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°

DRAWING CLASS.
DR. BY
DATE 8/1/77
CHKD BY
DESIGN BY
APPRVD BY

MATERIAL

FINISH

SYSTEMS CORPORATION
TITLE SCHEMATIC
PRESCALER
SIZE C
PART NO. 30244-03
REV. C
SCALE
SHEET 4 OF 4

SIZE C PART NO. REV.

BILL OF MATERIAL

30244-01 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL					DESCRIPTION	MATERIAL
			1	2	3	4	5		
0	30244-01	1						PRESCALER PC CARD ASS'Y	
1	30244-02D	1						PC CARD, ETCHED & DRILLED	
2	30244-03	REF						SCHEMATIC	
3	A257-01442-001	6						RELAY, 1706-1-1	
4	A257-01016-001	3						ICMODULE, LM308N	X11, X12, X16
5	A257-00099-001	1						" μA734	X15
6	A257-01046-000	1						" 74LS00	X13
7	A257-01046-004	1						" 74LS04	X3
8	A257-00048-001	2						" 7416N	X7, X8
9	A257-00012-367	1						" 74367	X1
10	A257-01046-138	3						IC MODULE 74LS138N	X2, X4, X9
11	A257-01046-174	1						" 74LS174	X6
12	A257-01046-367	1						" 74LS367	X5
13	A257-01001-001	1						" HP5082-4351	X14 (OR 6N136)
14	A257-01032-000	1						TRANSISTOR MPS-U60	Q1
15	A257-00060-004	4						DIODE IN4004	CR2, CR3, CR4, CR14
16	A257-01015-001	1						" IN825	CR1
17	A257-00000-001	6						" D501	CR5, CR6, CR7, CR8, CR9, CR10
18	A257-01036-001	1						" LM299H	VR1
19	A257-01061-615	1						I.C. MODULE OP-15FP	X 17
20									

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 2/1/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30244-01

REV. E

SHEET 1 OF 4

BRUNING 40-21 23352

BILL OF MATERIAL

30244-01 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
21	A257-00157-092	1						RESISTOR, 6.2K, 1/4W, ± .1%	R1
22	A257-00157-085	2						" 3.2K " "	R4, R6
23	A257-00157-073	1						" 1K " "	R3
24	A257-00120-056	1						" 13.75K " 1%	R15
25	A257-00120-038	1						" 6K " "	R13
26	A257-00120-035	1						" 5K " "	R14
27	A257-00120-006	1						" 1.25K " "	R16
28	A257-00120-004	1						" 1.15K " "	R10
29	A257-00120-001	1						" 1K " "	R12,
30	A257-00134-091	2						" 5.6K " ±5%	R19, R21
31	A257-00134-073	1						" 1K " "	R17, (R20 DELETED with REV C)
32	A257-00134-055	1						" 180Ω " "	R18
33	A257-00155-004	1						POTENTIOMETER, 100Ω	R5
34	A257-00236-002	5						CAPACITOR, 10µf@35V	C1, C2, C3, C4, C24,
35	A257-00232-006	1						" .1µf	C17,
36	A257-00232-001	24						" .01µf	C5-C15, C18-C21, C25, C28, C29, C35, C38-C42
37	A257-00207-008	2						" 20pf	C22, C26,
38	A257-00237-002	3						" 100pf	C16, C36, C37
39	A257-00134-085	1						RESISTOR, 3.3K, 1/4W ±5%	R11
40	30036-01	1						PLATE, FRONT	
41	A257-01613-001	1						LATCH, SWELL	

CUSTOMER APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 2/1/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30244-01

REV. E

SHEET 2 OF 4

BRUNING 40-21 23352

	BILL OF MATERIAL	30244-01	E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
42	A257-00157-190	1						RESISTOR, 7.3K, ¼W ± 0.1%	R2
43	A257-01016-004	1						IC MODULE, LM311N	X10
44	A257-00021-001	1						TRANSISTOR, TN02	Q2
45	A257-00038-001	2						TRANSISTOR, TN06	Q3, Q4
46	A257-00023-011	1						DIODE, IN746A	CR12
47	A257-00023-014	1						" IN747A	CR13
48	A257-00023-017	1						" IN748A	CR11
49	A257-01478-004	1						SWITCH, DIP, 4 POS	AMP# 435668-3 (S1)
50	A257-00140-049	1						RESISTOR, 100Ω, 2W ±5%	R35
51	A257-00136-066	4						" 510Ω, ½W, "	R36, R37, R38, R39
52	A257-00134-025	1						" 10Ω, ¼W, "	R34
53	A257-00134-037	1						" 33Ω, " "	R31
54	A257-00134-061	1						" 330Ω, " "	R32
55	A257-00134-066	1						" 510Ω, " "	R28
56	A257-00134-063	1						" 390Ω, " "	R23
57	A257-00134-089	1						" 4.7K " "	R22
58	A257-00134-090	1						" 5.1K " "	R26
59	A257-00134-084	1						" 3K " "	R30
60	A257-00134-097	1						" 10K " "	R24
61	A257-00135-005	1						" 20K " "	R25
62	A257-00135-014	1						" 47K " "	R27

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 4/8/77	DWG. NO. 30244-01
		CHKD. BY		REV. E
		APPRVD. BY		SHEET 3 OF 4

BRUNING 40-21 23352

BILL OF MATERIAL

30244-01 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
63	A257-00240-001	1						CAPACITOR, 6.8µf	C23
64	A257-00113-024	1						THERMISTOR, 500Ω NTC	R33
65	A257-00120-**	1						RESISTOR 1/4 1%	R29 (SELECT AT TEST)*
66									
67	A257-00120-156	2						RESISTOR 10Meg 1%	R7-R8
68	A257-00120-155	2						" 5meg 1%	R40,
69									
70									
71									
72									
73	A257-00155-015	2						" VARIABLE 200K	R49, R50
74									
75	A257-00155-014	1						" " 100K	R42
76	A257-01051-001	4						DIODE IN459A	CR15-CR18
77									
78									
79									
80	A257-00607-007	3						TERMINALS	
81	A257-000120-157	1						RESISTOR 4.9Meg, 1% MF	R41

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 8/1/77	DWG. NO. 30244-01 REV. E
		CHKD. BY		
		APPRVD. BY		SHEET 4 OF 4

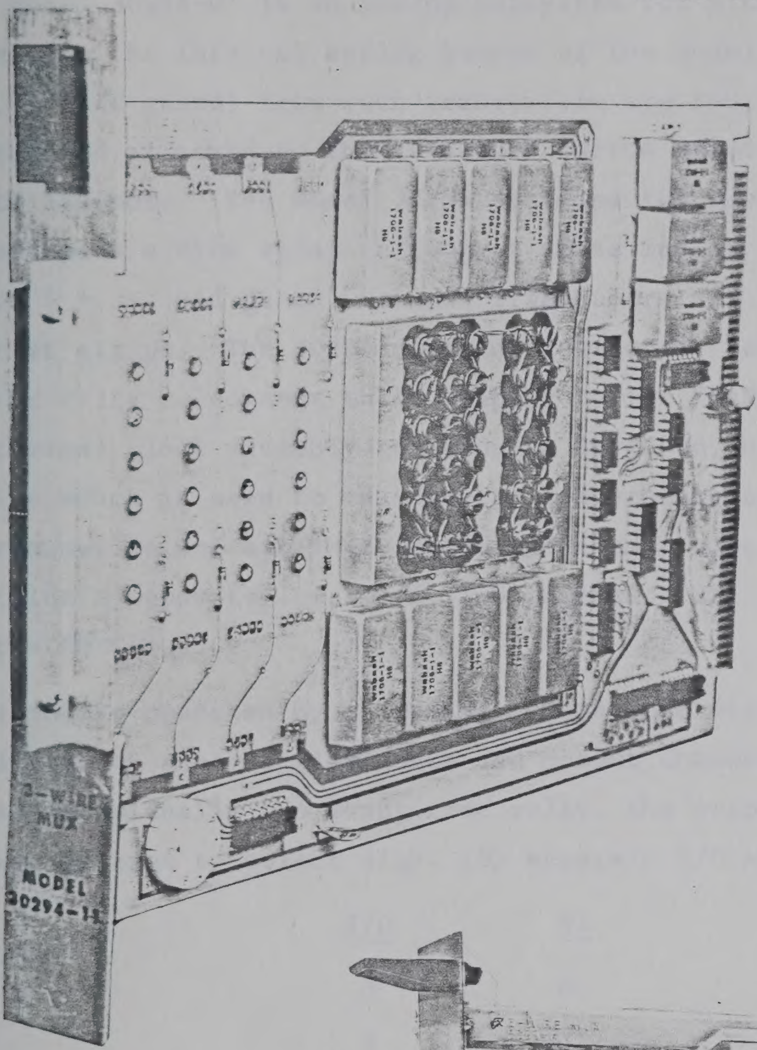
BRUNING 40-21 23352

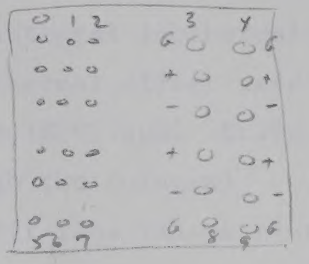
FX SYSTEMS CORPORATION

B&F INSTRUMENTS

PRODUCT DATA

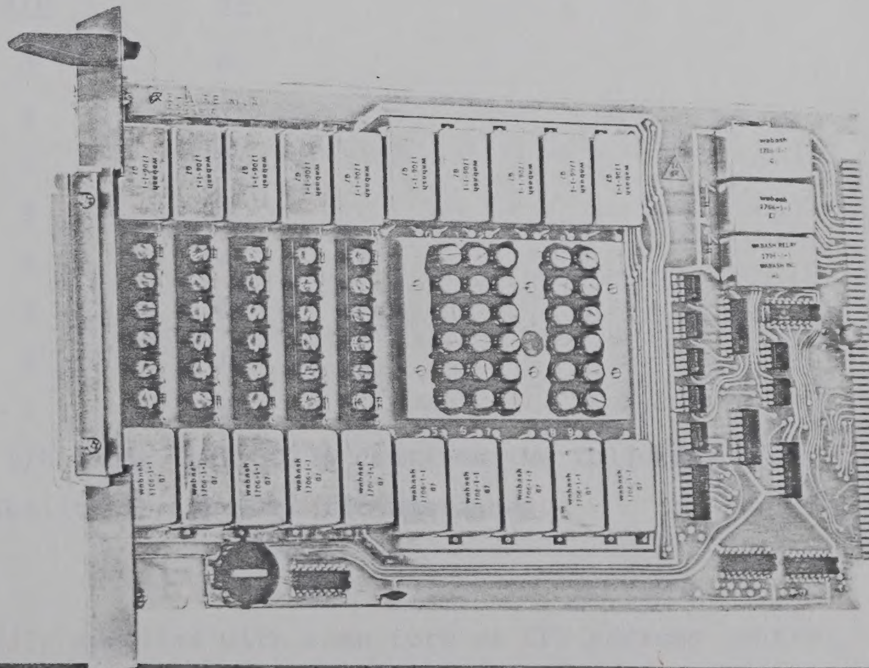
10 CHANNEL REED RELAY MUX - MODEL 30294-01 6-WIRE
MODEL 30294-11 3-WIRE


3-WIRE MUX
MODEL 30294-11


0 1 2
3 4
5 6 7
8 9

30294-11

3-WIRE MUX



30294-01

6-WIRE MUX

FX SYSTEMS CORPORATION PO BOX 1818 KINGSTON N.Y. 12401 914-338-0515
B&F INSTRUMENTS DIVISION PO BOX 238 CORNWELLS HEIGHTS, PA. 19020 215-639-7100

The Model 30294 is a standard module of the 27000 Series chassis and is designed to be used in one of the rear facing slots. The 6-wire version (30294-01) will be described first.

The Model 30294-01 is an analog subsystem for attaching up to ten 6-wire transducers to the internal analog busses of the Model 27000 chassis. Sense leads (+, -, and guard) from such transducers are routed through the integrated strain relief and attached to the labeled #6 screw terminals on the integral isothermal block assembly. The Model 30294 contains ten low-level, low thermal offset reed relays plus a tree relay to connect these inputs to the ANALOG INPUT bus. Drive leads (+, -, and guard) to such transducers are routed through the integral barrier strips. The 30294 contains low-level, low thermal drift reed relays plus a tree relay to connect these outputs to the TRANSDUCER DRIVE bus. The integral isothermal block assembly contains an imbedded, high precision thermolinear composite which is used to measure the temperature of the assembly in the event thermocouples are attached to the isothermal block as transducers. The Model 30294 contains a separate low level, low thermal drift reed relay to connect the composite to the COMP bus.

This module operates by accepting a data word written to it by the CPU. This data word selects a particular input and output channel relay to close. It may also close individually the input tree relay, the output tree relay, and the COMP relay. S1 may be used to select eight (8) separate I/O addresses as follows:

I/O	S1
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7

As is the case with the I/O cards, the 30294 contains the following links to provide addressing flexibility for special circumstances.

LINKS 1 - 3 & 1 - 2

The Model 30294 is normally supplied with some form of CPU address control. In this case link 1 - 3 is supplied. The circuitry is configured such that link 1 - 3

10 CHANNEL REED RELAY MUX (continued)

can be removed and replaced by link 1 - 2. In this configuration the state of the relays can be directly controlled. If P1-38 is low then DB0 through DB6 control the relays as per the BIT CHART A-30294-01. If P1-38 is high, then all relays are forced to the OFF state.

LINKS 4 - 5 & 4 - 6

The Model 30294 is normally supplied with 4 - 5 link and responds to I/O addresses for which the A3 bit is low. The Model 30294 may be configured to respond to I/O addresses for which the A3 bit is high if link 4 - 5 is removed and replaced by links 4 - 6.

LINK 15 - 8

The Model 30294 is normally supplied with the 15 - 8 link. However, the following configurations are also possible:

	I/O		
A6	A5	A4	LINK
0	0	0	15-8
0	0	1	14 - 8
0	1	0	13 - 8
0	1	1	12 - 8
1	0	0	11 - 8
1	0	1	10 - 8
1	1	0	9 - 8
1	1	1	7 - 8

LINKS 17 - 6 & 18 - 16

The Model 30294 is normally supplied with the 17 - 16 link and responds to I/O addresses for which the A7 bit is low. The Model 30294 may be configured to respond to I/O addresses for which the A7 is high if link 17 - 16 is removed and replaced by link 18 - 16.

The Model 30294-11 is a modified version of the Model 30294. The following items have been deleted:

1. The ten transducer drive relays.
2. The output tree relay.
3. The barrier strips.

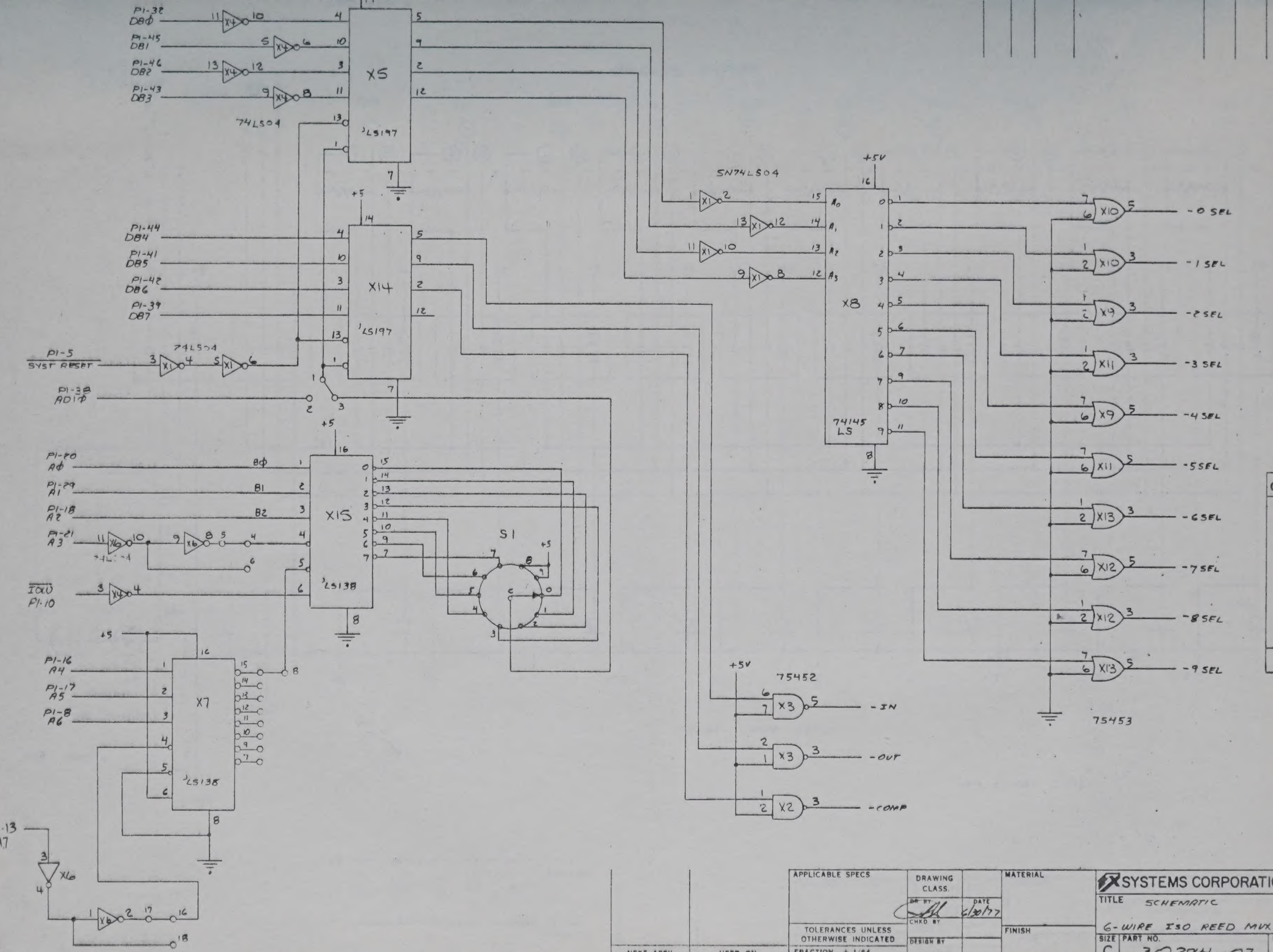
This converts the card to a 3-wire version. Performance specifications are otherwise unchanged.

WORD	OUT

ASS'Y	30294-01

ADDRESS																	
		BINARY															
HEX	DECIMAL	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
	0																

BIT	IDENTITY	"1" CONDITION
BD 00	CHANNEL BCD 1	POSITIVE TRUE
BD 01	" " 2	↓
BD 02	" " 4	↓
BD 03	" " 8	↓
BD 04	INPUT TREE RELAY	ON
BD 05	OUTPUT TREE "	↓
BD 06	COMP "	↓
BD 07		
BD 08		
BD 09		
BD 10		
BD 11		
BD 12		
BD 13		
BD 14		
BD 15		


P1-32 DBΦ
P1-45 DB1
P1-46 DB2
P1-43 DB3
74LS04
X5
'LS197
P1-44 DB4
P1-41 DB5
P1-42 DB6
P1-39 DB7
X14
'LS197
P1-5 SYST RESET
74LS04
P1-38 AD1Φ
P1-20 AΦ
P1-29 A1
P1-18 A2
P1-21 A3
IOW P1-10
BΦ
B1
B2
X15
'LS138
S1
+5
P1-16 A4
P1-17 A5
P1-8 A6
X7
'LS138
P1-13 A7
X6
SN74LS04
+5V
X8
74145 LS
X1
X4
X10
X9
X11
X12
X13
75453
-0 SEL
-1 SEL
-2 SEL
-3 SEL
-4 SEL
-5 SEL
-6 SEL
-7 SEL
-8 SEL
-9 SEL
75452
X3
X2
-IN
-OUT
-COMP

SIZE	PART NO.	REV.
C		

APPLICABLE SPECS	DRAWING CLASS.		MATERIAL
	DR BY	DATE 6/30/77	
TOLERANCES UNLESS OTHERWISE INDICATED	CHKD BY		FINISH
FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DESIGN BY		
	APPRVD BY		

NEXT ASSY	USED ON
APPLICATION	

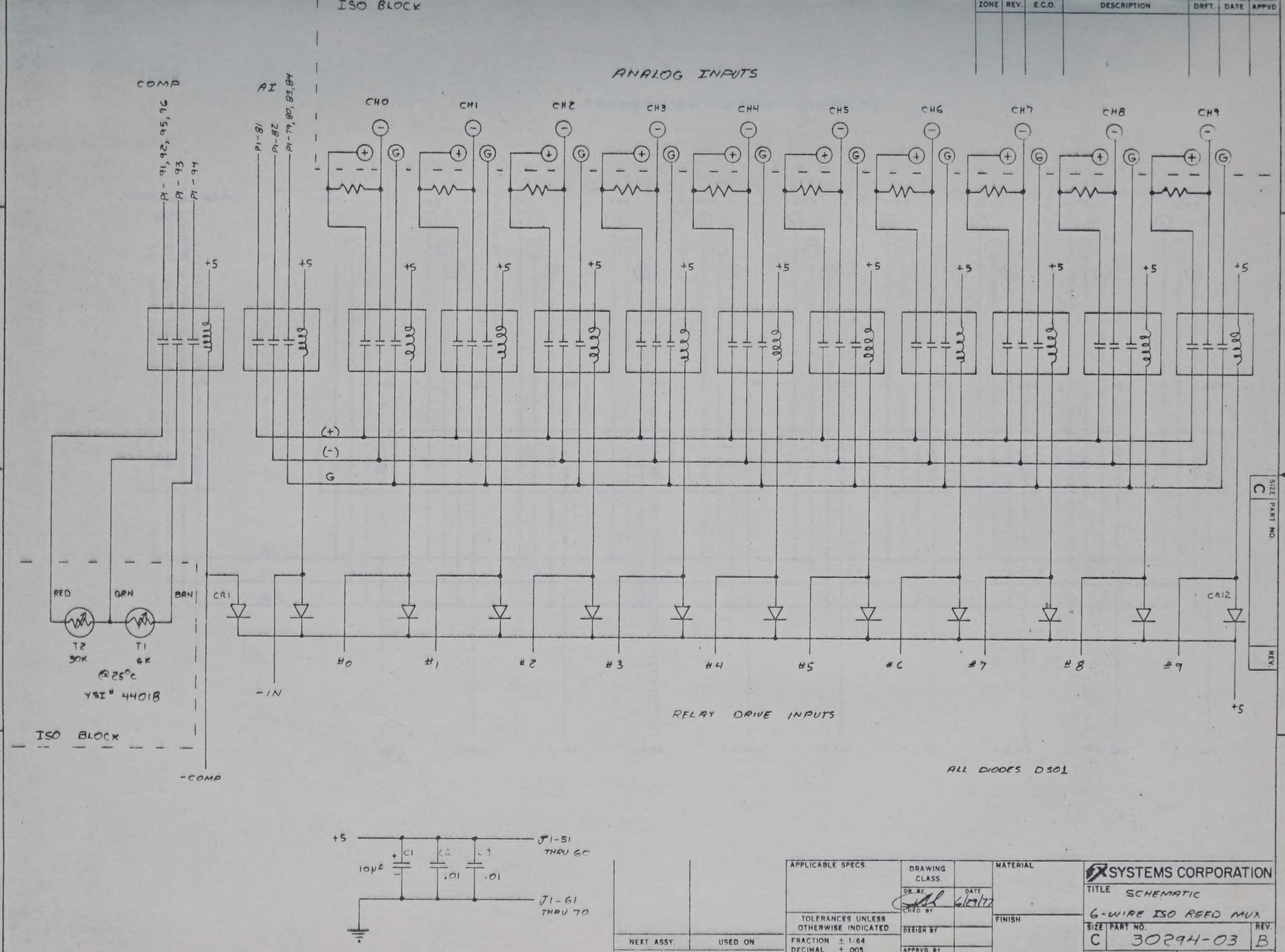
SYSTEMS CORPORATION

TITLE SCHEMATIC

6-WIRE ISO REED MUX

SIZE	PART NO.	REV.
C	30294-03	B
SCALE	SHEET 1 OF 3	

ZONE	REV.	E.C.O.	DESCRIPTION	DRFT.	DATE	APPVD


ISO BLOCK
ANALOG INPUTS
COMP
P1 - 91, 92, 95, 96
P1 - 93
P1 - 94
AI
P1-81
P1-82
P1-79, 80, 83, 84
CH0
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
CH9
+
−
G
+5
(+)
(−)
G
RED
GRN
BRN
T2
30K
T1
6K
@25°C
YSI # 44018
ISO BLOCK
-COMP
-IN
CR1
CR12
#0
#1
#2
#3
#4
#5
#6
#7
#8
#9
+5
RELAY DRIVE INPUTS
ALL DIODES D501
+5
C1
C2
C3
10µf
.01
.01
J1-51 THRU 60
J1-61 THRU 70
D
C
B
A
SIZE C PART NO. REV.
BRUNING 40-21 23352

NEXT ASSY.	USED ON
APPLICATION	

APPLICABLE SPECS.

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°

DRAWING CLASS.
DR BY
DATE 6/29/77
CHKD BY
DESIGN BY
APPRVD BY

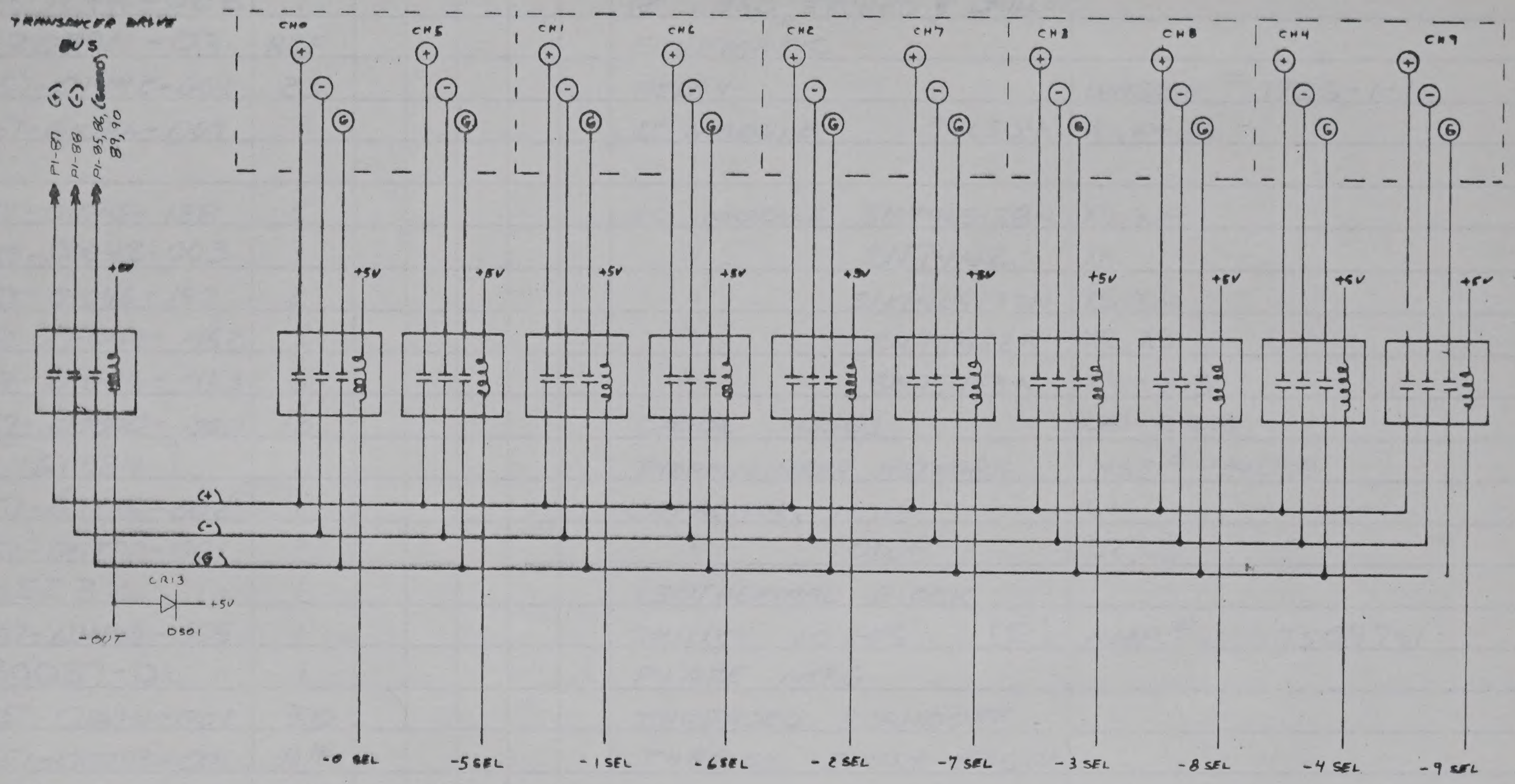
MATERIAL

FINISH

SYSTEMS CORPORATION
TITLE SCHEMATIC
6-WIRE ISO REED MUX
SIZE C
PART NO. 30294-03
REV. B
SCALE
SHEET 2 OF 3

ZONE	REV.	E.C.O.	DESCRIPTION	DRFT.	DATE	APPVD

TRANSDUCER DRIVE OUTPUTS


TRANSDUCER DRIVE BUS
(+)
(-)
P1-87
P1-88
P1-85,86, 89,90
+5V
(+)
(-)
(G)
CR13
+5V
DS01
-OUT
CH0
CH5
CH1
CH6
CH2
CH7
CH3
CH8
CH4
CH9
+
-
G
+5V
-0 SEL
-5 SEL
-1 SEL
-6 SEL
-2 SEL
-7 SEL
-3 SEL
-8 SEL
-4 SEL
-9 SEL

SIZE C PART NO. REV.

NEXT ASSY	USED ON
APPLICATION	

APPLICABLE SPECS

TOLERANCES UNLESS OTHERWISE INDICATED
FRACTION ± 1/64
DECIMAL ± .005
ANGLE ± 1/2°

DRAWING CLASS
DR BY Rfd DATE 6/29/77
CHKD BY
DESIGN BY
APPRVD BY

MATERIAL
FINISH

SYSTEMS CORPORATION
TITLE SCHEMATIC
6-WIRE ISO REED MUX
SIZE C PART NO 30294-03 REV. B
SCALE SHEET 3 OF 3

BILL OF MATERIAL

30294-01 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
0	30294-01	1						6-WIRE ISO MUX PC CARD ASS'Y	
1	30294-02B	1						PC CARD, ETCHED & DRILLED	
2	30294-03	REF						SCHEMATIC	
3	A257-01442-001	23						RELAY	WABASH # 1706-1-1
4	A257-01046-004	3						IC MODULE 74LS04	X1, X4, X6
5									
6	A257-01046-138	2						IC MODULE SN74LS138N	X7, X15
7	A257-00042-003	1						" SN7442	X8
8	A257-01046-197	2						" SN74LS197N	X5, X14
9	A257-01049-452	2						" SN75452N	X2, X3
10	A257-01049-453	5						" SN75453N	X9 - X13
11	A257-00000-000	13						DIODE, DS01	CR1-CR13
12	[161934]	1						THERMILINEAR NETWORK	YSI # 44018
13	A257-00236-002	1						CAPACITOR, 10µf	C1
14	A257-00232-001	2						" .01µf	C2, C3
15	15232	1						ISOTHERMAL BLOCK	
16	A257-01449-005	1						SWITCH, 10 POS (S1)	AMP # 1-435097-1
17	30037-01	1						PLATE, MTG	
18	A257-01614-001	30						THREADED STANDOFF	
19	A257-00723-001	A/R						THERMAL EPOXY RESIN	
20	A257-00723-002	A/R						THERMAL EPOXY HARDENER	

CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 7/1/77	DWG. NO. 30294-01
		CHKD. BY		REV. E
		APPRVD. BY		SHEET 1 OF 2

RUNING 40-21 23352

BILL OF MATERIAL

30294-01 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL					DESCRIPTION	MATERIAL
			1	2	3	4	5		
21	- - -	1							
22		A/R						FOAM TAPE	
23	A257-01613-001	1						LATCH, SWELL	
24	A257-01465-001	5						BARRIER STRIP	CINCH # 6-176-2
25	29043-01	1						CABLE CLAMP	
26	29043-01	1						CABLE CLAMP	

CUSTOMER
APPLICABLE SPECS.

REVISIONS:

DRAWING
CLASS.

DR. BY

DATE 7/1/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30294-01

REV. E

SHEET 2 OF 2

RUNING 40-21 23352

BILL OF MATERIAL

30294-11 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL					DESCRIPTION	MATERIAL
			1	2	3	4	5		
0.	30294-11	1						3-WIRE ISO MUX PC CARD ASS'Y	
1	30294-02B	1						PC CARD, ETCHED & DRILLED	
2	30294-03	REF						SCHEMATIC	
3	A257-01442-001	13						RELAY	WABASH # 1706-1-1
4	A257-01046-004	3						IC MODULE SN74LS04	X1, X4, X6
5									
6	A257-01046-138	2						IC MODULE SN74LS138N	X7, X15
7	A257-00042-003	1						" SN7442	X8
8	A257-01046-197	2						" SN74LS197N	X5, X14
9	A257-01049-452	2						" SN75452N	X2, X3
10	A257-01049-453	5						" SN75453N	X9-X13
11	A257-00000-000	13						DIODE, DS01	CR1-CR13
12	[161934]	1						THERMILINEAR NETWORK	YSI # 44018
13	A257-00236-002	1						CAPACITOR, 10µf	C1
14	A257-00232-001	2						" .01µf.	C2, C3
15	15232	1						ISOTHERMAL BLOCK	
16	A257-01449-005	1						SWITCH, 10 POS (S1)	AMP # 1-435097-1
17	30037-03	1						PLATE, MTG	
18	A257-01614-001	30						THREADED STANDOFF	
19	A257-00723-001	A/R						THERMAL EPOXY RESIN	
20	A257-00723-002	A/R						THERMAL EPOXY HARDENER	

CUSTOMER
APPLICABLE SPECS.

REVISIONS:

DRAWING CLASS.

DR. BY

DATE 7/1/77

CHKD. BY

APPRVD. BY

SYSTEMS CORPORATION

DWG. NO. 30294-11

REV. E

SHEET 1 OF 2

BILL OF MATERIAL

30294-11 E

ITEM	PART NO.	TOTAL QTY.	QTY. AT LEVEL 1	2	3	4	5	DESCRIPTION	MATERIAL
21	—	1							
22		A/R						FOAM TAPE	
23	A257-01613-001	1						LATCH, SWELL	
24	29043-01	1						CABLE CLAMP	
25	29043-02	1						CABLE CLAMP	
26									

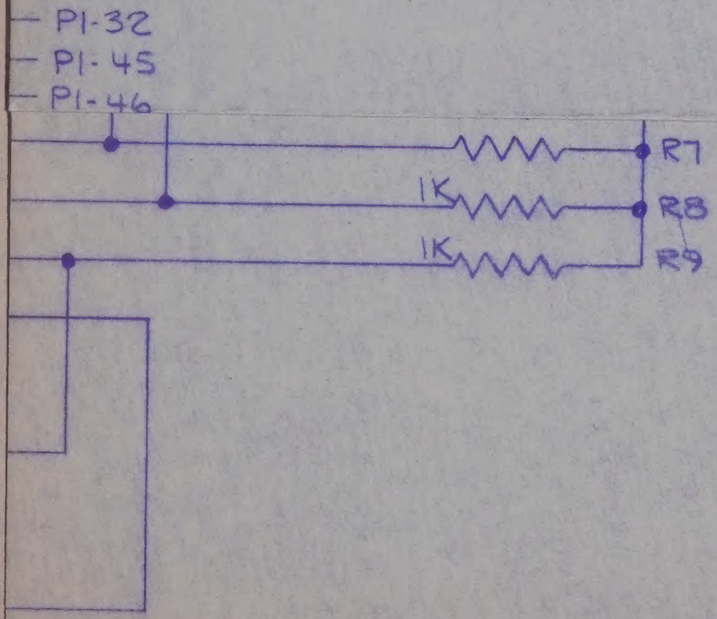
CUSTOMER APPLICABLE SPECS.	REVISIONS:	DRAWING CLASS.		SYSTEMS CORPORATION
		DR. BY	DATE 7/1/77	DWG. NO. 30294-11
		CHKD. BY		REV. E
		APPRVD. BY		SHEET 2 OF 2

NG 40-21 23352

1

REVISIONS						
ZONE	REV.	E.C.O.	DESCRIPTION	DRFT.	DATE	APPVD

D

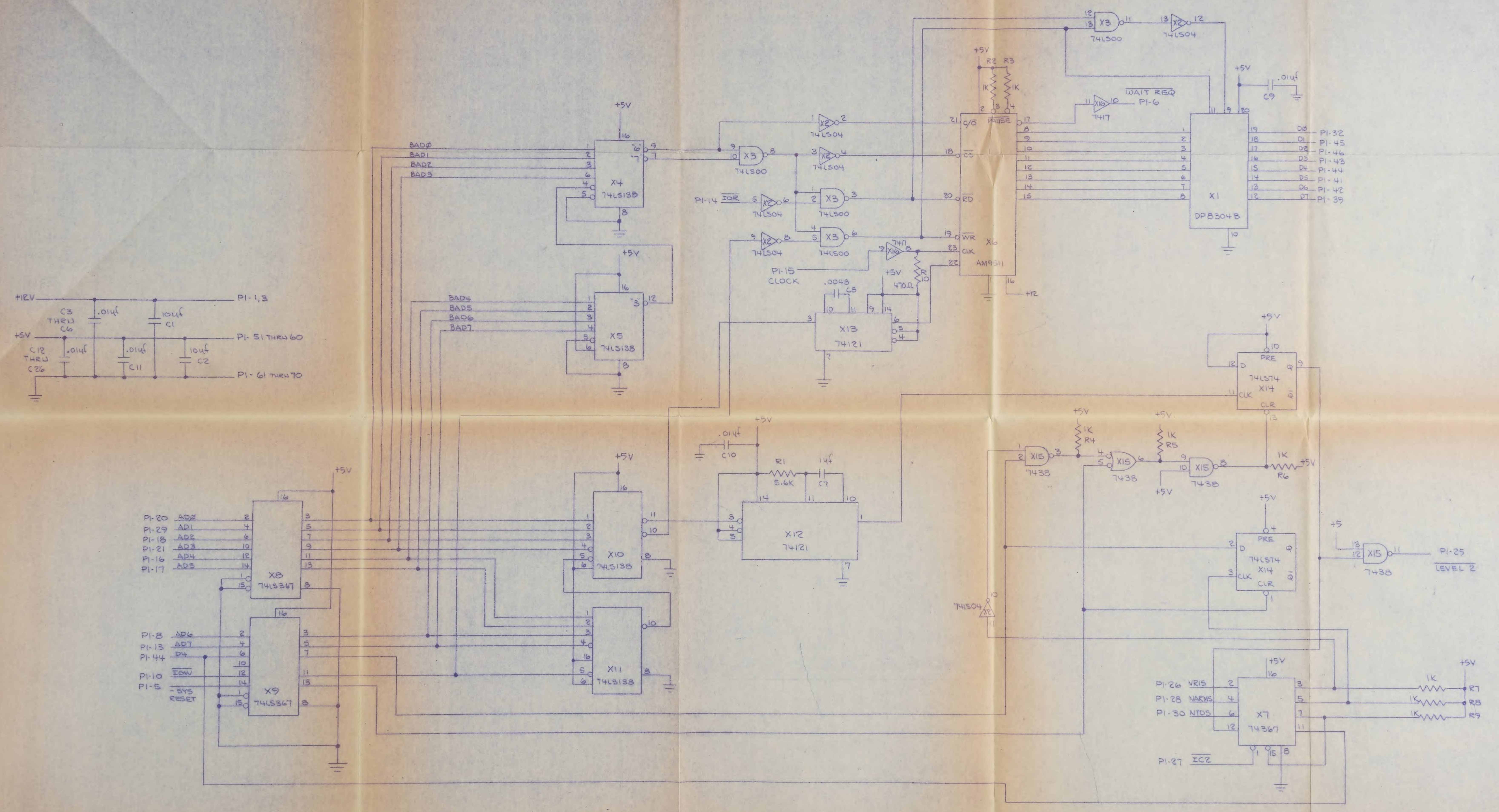

P1-32
P1-45
P1-46
R7
1K
R8
1K
R9

A

DATE 2-7-79	MATERIAL	FX SYSTEMS CORPORATION
		TITLE SCHEMATIC - APU (ARITHMATIC PROCESSING UNIT)
	FINISH	SIZE D · PART NO. 30275-03 · REV. D
		SCALE · SHEET 1 OF 1

1

REVISIONS						
ZONE	REV.	E.C.O.	DESCRIPTION	DRFT.	DATE	APPVD



+12V
+5V
P1-1,3
P1-51 THRU 60
P1-61 THRU 70
C3 THRU C6
C12 THRU C26
.01uf
10uf
C1
C2
C11
BAD0
BAD1
BAD2
BAD3
BAD4
BAD5
BAD6
BAD7
X4 74LS138
X5 74LS138
X3 74LS00
X2 74LS04
P1-14 IOR
P1-15 CLOCK
X16 7417
WAIT REQ P1-6
R2 R3 1K 1K
C/S
PAUSE
CS
RD
WR
CLK
X6 AM9511
+12
470Ω
R10
.0048 C8
X13 74121
X1 DP8304B
C9
D0 P1-32
D1 P1-45
D2 P1-46
D3 P1-43
D4 P1-44
D5 P1-41
D6 P1-42
D7 P1-39
P1-20 AD0
P1-29 AD1
P1-18 AD2
P1-21 AD3
P1-16 AD4
P1-17 AD5
X8 74LS367
P1-8 AD6
P1-13 AD7
P1-44 D4
P1-10 IOW
P1-5 -SYS RESET
X9 74LS367
X10 74LS138
X11 74LS138
.01uf C10
R1 5.6K
1uf C7
X12 74121
PRE
D
Q
CLK
CLR
74LS74 X14
X15 7438
1K R4
1K R5
1K R6
74LS04 X2
+5
P1-25 LEVEL 2
P1-26 NRIS
P1-28 NARMS
P1-30 NTDS
X7 74367
P1-27 IC2
1K
R7
R8
R9

NEXT ASSY.	USED ON	APPLICABLE SPECS.	DRAWING CLASS.		MATERIAL
APPLICATION			DR. BY FES	DATE 2-7-79	
			CHKD. BY		FINISH
		TOLERANCES UNLESS OTHERWISE INDICATED FRACTION ± 1/64 DECIMAL ± .005 ANGLE ± 1/2°	DESIGN BY		
			APPRVD. BY		

SYSTEMS CORPORATION

TITLE
SCHEMATIC - APU
(ARITHMATIC PROCESSING UNIT)

SIZE	PART NO.	REV.
D	30275-03	D

SCALE
SHEET 1 OF 1